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CONTENTS.

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No. 1. *January.*

	PAGE
The Færoes. By Karl Grossman, M.D., F.R.C.S.E.	1
Journeys in Persia (1890–91). By Captain H. B. Vaughan, 7th Bengal Infantry	24
The Origin of the Kafir of the Hindu Kush. By Colonel T. H. Holdich, R.E., C.B., C.I.E.	42
Lake Louise, in the Canadian Rocky Mountains. By Walter D. Wilcox	49
Account of a Visit to Niuafóu. By Lieut. Boyle T. Somerville, of H.M.S. *Penguin*	65
Recent Geographical Bibliographies. By Hugh Robert Mill, D.Sc.	72
The Land of the Bataks. By Baron Anatole von Hügel	75
Journeys and Explorations on the Pilcomayo River. By Lieut. O. J. Storm	82
The Monthly Record	90
Obituary	103
Correspondence	105
Meetings of the Royal Geographical Society	105
Geographical Literature of the Month	106
New Maps	120

MAPS AND ILLUSTRATIONS.—

Sketch-Map—The Færoe Islands	3
View from Leinum looking South	5
Bay of Klaksvig looking North	7
Tindholm from South	9
Myggenæs—Landing-place with Boat	11
Cliff south of Saxen (Stromö), showing the Weathering of Dykes and Formation of Caves	13
Drangar and Tindholm from North-East, the Upper Surfaces giving Profile of Cirque	15
Glacial Striæ at Trangisvaag	17
Sketch-Maps—Lake Louise Region	51,53
Lake Louise from near the End on West Shore, looking South-West	55
Looking towards Mount Lefroy, 11,370 feet, from the Summit of Coat Mountain, 8918 feet, four miles distant	57
Entrance to Paradise Valley, looking South of West	59
Mount Temple, 11,658 feet, from the "Saddle," looking South	61
Mount Temple, with less Foreground, to show the Depth of Valley	63
Plan of Niuafou (from Eye-Sketch)	66
View of Craters and Eruption of 1886, from above Angaha	67
View from 380 feet Summit above Haafoi Village	68
Sketch-Map of the Upper Niger Region	98
Sketch-Map of British Guiana	100
Map of Capt. H. B. Vaughan's Routes through Central Persia	124

No. 2. *February.*

PAGE

Exploration in the Japanese Alps, 1891–1894. By the Rev. Walter Weston, M.A. 125
Notes on a Journey in Tarhuna and Gharian, Tripoli. By H. S. Cowper, F.S.A. 150
Journeys in Persia (1890–91). By Captain H. B. Vaughan, 7th Bengal Infantry 163
The Land of the Bataks. By Baron Anatole von Hügel 175
A Visit to Lake Chiuta, British Central Africa. By Robert Codrington .. 183
Recent Discoveries in the Basin of the River Madre De Dios (Bolivia and Peru). By Clements R. Markham, C.B., F.R.S. 187
Professor Ramsay's Work on Phrygia.—Review. By Sir Charles W. Wilson, K.C.B., K.C.M.G., etc. 190
M. Marcel Dubois on Colonial Systems and Colonizing Peoples. By G. G. Chisholm, M.A., B.SC. 193
Dr. Sven Hedin in Central Asia 195
The Monthly Record 198
Obituary 209
Correspondence 210
Meetings of the Royal Geographical Society 211
Geographical Literature of the Month 211
New Maps 225

MAPS AND ILLUSTRATIONS.—Hodakayama from the East 127
Ridge south of Yarigatake, from the North-East 129
Ravine south of Kasadake 131
Outer Edge of Crater of Ontake 133
Ono No Taki (Waterfall) on Nakasendo 135
Silk Filatures on the Tenryugawa 140
Hashido, Bridge over Ontakegawa 141
Shrine on Summit of Ontake, 10,000 feet .. 143
Mountain Pilgrim 145
The Watercourse of Wadi Doga, near Kasr Fasgha, looking North-West 151
Wadi Doga near Kasr Doga, looking North .. 151
Senam at Kom Es Las, Tarhuna 153
Kasr Zuguseh (Ferjana District), with Carved Stone 155
Roman Wall (Dam ?) in Wadi Daun 157
Senam Bu Matirah in Wadi Kseia 157
Senam El Megagerah, Western Tarhuna 159
Jebel Jumma 159
Shaahbet el Zeraghwanieh 161
Isolated Hills on the Plain near Mouth of Wadi Haira 161
Sketch-Map of Route from Chikala to Lujende 185
The *Challenger* Medal 207
Sketch-Map of the Japanese Alps 228
Map of Part of Tarhuna and Gharian (Tripoli) 228

No. 3. *March.*

Movements of the Earth's Crust. By John Milne, F.R.S., F.G.S. 229
The Movements of the Surface Waters of the North Sea. By H. N. Dickson, F.R.S.E. 255
The Guinea and Equatorial Currents. By J. Y. Buchanan, F.R.S. 267
Recent African Books. By Edward Heawood, M.A. 270
Boundaries of British Guiana—The Evidence of Maps. By Clements R. Markham, C.B., F.R.S., President R.G.S. 277, 309
Cuinet's 'Turkey in Asia.'—Review. By Geo. G. Chisholm, M.A., B.SC. .. 281
The Geography of Mammals. By W. L. Sclater, M.A., F.Z.S. 282
The Marshall Islands. By Dr. Steinbach 296
Boundary Treaties in Siam and Indo-China 297
From Yun-nan to British India. By Prince Henry of Orleans 300
The Monthly Record 310
Obituary 320–324

PAGE
Meetings of the Royal Geographical Society 325
Geographical Literature of the Month 326
New Maps 341
MAPS AND ILLUSTRATIONS.—Diagrams illustrating "Movements of the Earth's Crust," Figs. 1–10 251–255
Barometer Charts, Figs. 1–5 258–261
Sketch-Map of Siam and Indo-China 298
Sketch-Map—Territory between Tali-fu (Yunnan) and Sadiya (Assam) 302
Surface Salinity of the North Sea, Plates 1–5 .. 344
Surface Temperature of the North Atlantic Ocean and the North Sea, Plates 6–10 .. 344
Map of the Ethiopian Region, showing its Division into Four Subregions 344

No. 4. *April.*

Proposed Geographical Description of the British Islands based on the Ordnance Survey. By Hugh Robert Mill, D.SC., F.R.S.E. 345
The Discovery of the Moluccas. By Dr. O. Warburg 365
The Geography and Resources of British Central Africa. By Alfred Sharpe 366
Notes on Ancient and Mediæval Makran. By Colonel T. H. Holdich, C.B., C.I.E., R.E. 387
On a Journey from Machako's to Kitwyi. By John Ainsworth 406
Geographical Work of the Geological Survey of Canada in 1895. By Dr. George M. Dawson, C.M.G., F.R.S. 412
General Chapman's Proposed Mapping of Africa 414
Recent Gazetteers 415
Dr. Partsch's 'Silesia,—A Geographical Study' 417
Glaser on the Abyssinians.—Review 420
The Island of Sakhalin. By Professor von Krasnow 422
The Monthly Record 425
Obituary 435
Meetings of the Royal Geographical Society 436
Geographical Literature of the Month 437
New Maps 449
MAPS AND ILLUSTRATIONS.—The Zambezi near Chapinga 369
Portuguese Chiromo, on the Ruo 371
Upper Shire Rapids 373
South End of Lake Nyasa 375
Yao Village, Blantyre 377
The Peak of Cheza, in the Mlanji Hills 379
Falls of the Ruo 381
Native Woman on Zomba Slopes 382
Stream at Fort Lister, Mlanje 383
Mlanje Post-Office 384
Sketch-Map of Ancient and Mediæval Makran .. 452
Sketch-Map of Ulu and Kitwyi (Ukamba) .. 452

No. 5. *May.*

A Journey across Tibet, from North to South. By St. George R. Littledale 453
The First Crossing of the Southern Alps of New Zealand. By Edward A. Fitz Gerald 483
Cruise of the *Balæna* and *Active* in the Antarctic.—I. The *Balæna*. By W. S. Bruce 502
Journal of an Excursion in Oman, in South-East Arabia. By Colonel S. B. Miles 522
Dr. John Murray on the Marine Fauna of the Kerguelen Region 538
Note to Sketch-Map of the Upper Kuyuni. By Lieut. Godfrey-Faussett, R.E. 541
The Use of Balloons in Geographical Work. By A. Berson 542
The Monthly Record 544
Correspondence 557
Obituary 558

PAGE

Meetings of the Royal Geographical Society 559
Geographical Literature of the Month 560
New Maps 572
MAPS AND ILLUSTRATIONS.—Boat laden with Baggage on the Sachu Chu .. 457
Near the Goring La 459
A Typical Tibetan Valley 461
A Tibetan Group in the Goring Tangu Valley 463
Lamas' Encampment with Piles of Firewood .. 465
The Tasman Valley, looking towards the Hooker 485
Looking down towards the Marchant Valley from Fitz Gerald's Saddle 487
Looking down the Copland River, showing where the Gorge closed in 489
Showing the Cliff Precipices coming down to the Victoria Glacier 491
Mount Tasman, from Blackburne's Saddle .. 493
The Head of the Franz Josef Glacier .. . 495
Graham's Saddle, from the Eyre Glacier 497
Sketch-Map—North-East Graham Land 509
Maps of Mr. Littledale's Routes in Tibet 576
Sketch-Map of the Southern Alps of New Zealand 576
Sketch-Map of the Wadi Tyin 576
Sketch-Map of the Upper Kuyum 576

No. 6. *June.*

The Country of the Shans. By Colonel R. G. Woodthorpe, C.B., R.E. 577
The Waterways of English Lakeland. By J. E. Marr, M.A., F.R.S., Sec. Geol. Soc. 602
Cruise of the *Balæna* and the *Active* in the Antarctic Seas, 1892–93.—II. The *Active*. By Charles W. Donald, M.B. 625
Ancient Trading Centres of the Persian Gulf. By Capt. Arthur W. Stiffe, R.I.M. 644
Diagram for Determining the Parallexes in Declination and Right Ascension of a Heavenly Body, and its Application to the Prediction of Occultations. By Major S. C. M. Grant, R.E. 649
The Monthly Record 654
Obituary 666–68
Correspondence 668
Meetings of the Royal Geographical Society, Session 1895–96 675
Geographical Literature of the Month 676
New Maps 686
MAPS AND ILLUSTRATIONS.—The Mekong above Tang Aw 579
Wan Tham 581
Ferry at Ban Law 583
Inle Lake 585
Western Shans 589
A Kaw Village above the Mekong 592
Keng Kong 595
Monastery, Pung Pyin 597
Map of the Lake District 603
View of Edenside 606
Diagram-Sections 607, 612
Head of High Cup Gill 608
Nunnery Walks 609
Haweswater from Measand 614
Sty Head Tarn, looking towards the Outlet .. 617
Alluvial Flat in Stonethwaite, with Gorge in Foreground 618
Sketch-Map of the Shan States 688
Map to illustrate a Paper on the Waterways of English Lakeland 688
Diagrams for predicting the circumstances of an Occultation of a Star by the Moon .. 688

The
Geographical Journal.

No. 1. JANUARY, 1896. Vol. VII.

THE FÆROES.*

By KARL GROSSMANN, M.D., F.R.C.S.E.

The following gives a short general account of three visits made to the Færoes in 1892, 1894, and 1895. On all three occasions I was accompanied by my friend Dr. Cahnheim, of Dresden; in 1894 also by my friend Mr. Lomas, of Liverpool. We so constantly and completely co-operated in every work done, that in this present article, as well as in a few more that have already appeared or will soon follow, we have all three a share, if not in the actual writing, at all events in the observations and views expressed therein.

As a map, we had with us the latest edition of the Admiralty chart, which is based on a survey by Captain Born in 1806. During the past summer (1895) a new survey has been commenced by a staff of Danish officers, but it is not likely that it will be finished for many years; and judging from the samples of one or two districts which we were privileged to inspect, the work promises to be excellent.

About midway between the west coast of Scotland and the south-east corner of Iceland, on the submarine volcanic ridge which connects both countries, a group of high peaks rises above the surface of the sea, forming a cluster of islands, called the Færoes. These islands, twenty-two in number, besides countless stacks, are mostly rocky and steep—so steep, in fact, that of their number nineteen only are inhabited by man, while the rest are scarcely accessible, and afford support only to numerous flocks of sheep.

* Paper read at the Royal Geographical Society, November 25, 1895. Fær-öer means Sheep Islands; hence it would be a pleonasm to speak of Færoe Islands. Fair Isle has the same etymology.

The whole group of islands may be divided into a smaller southern group, formed by Suderö and the small isles Lille Dimon and Store Dimon, and a larger northern group, which comprises the remainder, and stretches a long distance from the eastern to the western extremity (from the most eastern to the most western island) in one direction, and from north-west to south-east in the other.

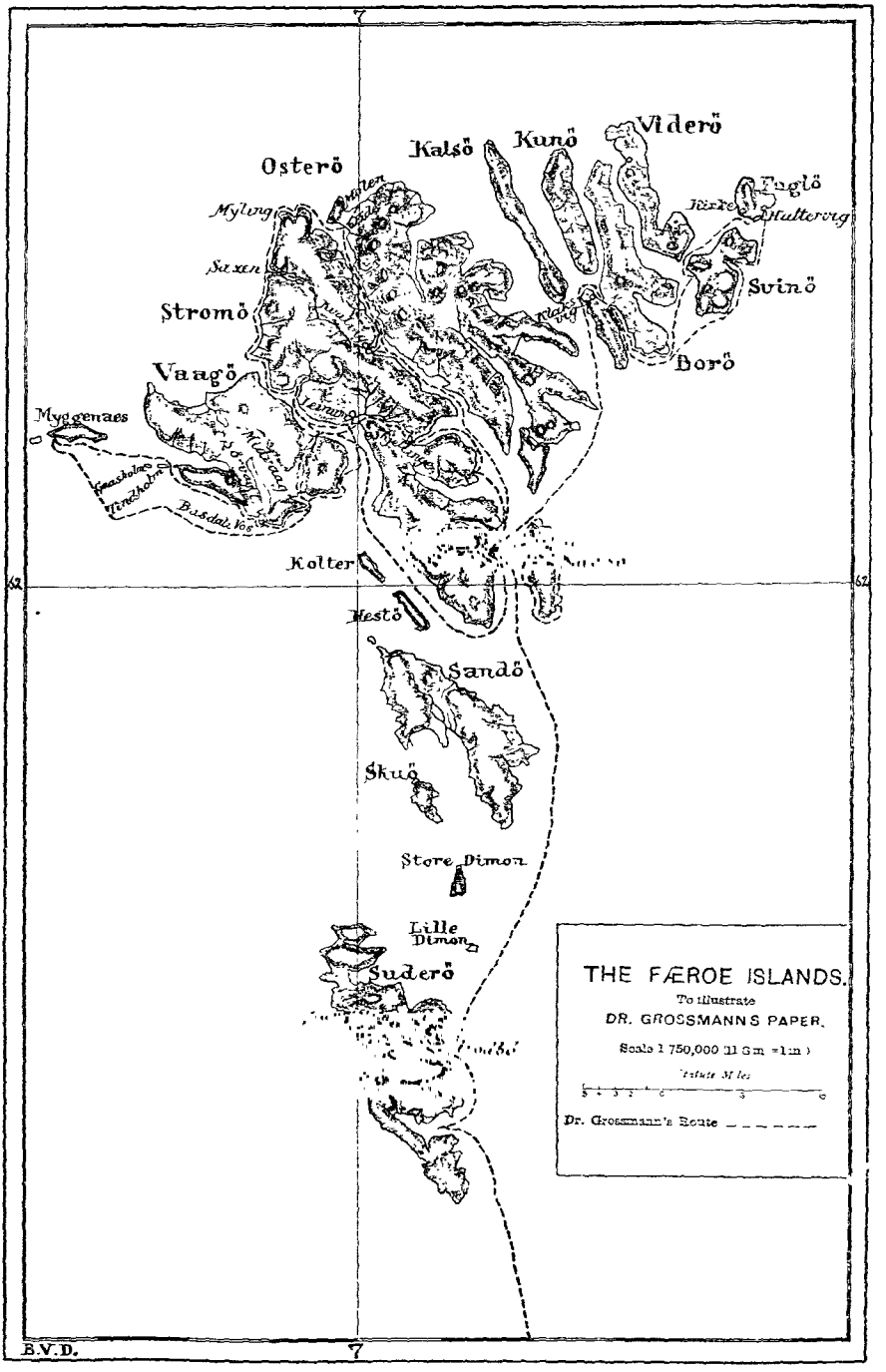
The general trend of the islands is from north-north-west to south-south-east. In this direction the mountains run and the principal fjords and valleys lie. If we were to draw a line from the most easterly to the most westerly point, from Fuglö to Myggenæs, it would cross the fjords and mountain ridges almost at right angles, and would mark the line of parting of the ancient icesheds and of the present watersheds. Along this line we find several saddles, or "cols," separating the northern from the southern part of a fjord; if the land were to sink only a few fathoms, these fjords would form separating channels like the one we see between the two largest islands, Stromö and Osterö. In that particular channel we find, on the spot which corresponds to the parting-line, a shallow called the "Sund," not more than 3 fathoms deep, where navigation is impossible except for small boats.

The geological structure of the Færoes is extremely simple, because of its great uniformity. The islands consist of a large number of layers of volcanic rock, consisting of vesicular as well as of more compact lava-flows with a generally low dip; hence a characteristic feature occurring so frequently in Færoese scenery—the straight horizontal outline of the mountain-tops. Often these lavas are exceedingly rich in amygdules, the cavities occasionally reaching a diameter of 2 feet and more. Exquisite zeolites are found in these cavities, and it is well known that the Færoes have supplied most museums with the finest specimens of these minerals.

Besides the amygdaloids and the lava, we find, though not frequently, columnar basalt in a few large intrusive sheets. The large sheet of Stromö at Skellinge has been known for a long time; in Suderö the basalt forms three fine sheets of columnar basalt, one at the entrance of the harbour just below Frodbö, another exposed close to the road at the western extremity of the village of Trangisvaag, in a quarry. High up above the village there is a third layer which stretches towards Frodbö.

The finest columns of all, however, were found by us in Myggenæs, at an altitude of 1400 feet, the thickness of the sheet varying from 60 to 80 feet. In the eastern islands we saw a very large intrusive sheet of basalt a little east of Kirke, on the southern cliff of Fuglö, and similarly one on the northern cliff of Svinö; possibly these two have formerly been parts of the same sheet.

In going from Kalbaksfjord (Stromö) overland to Leinum, we traversed an extensive sheet of basalt showing beautiful porphyritic


Osterö
Kalsö
Kunö
Viderö
Fuglö
Svinö
Borö
Stromö
Vaagö
Myggenaes
Kolter
Hestö
Sandö
Skuö
Store Dimon
Lille Dimon
Suderö
THE FÆROE ISLANDS.
To illustrate
DR. GROSSMANN'S PAPER.
Dr. Grossmann's Route
B.V.D.

structure; in a matrix of chocolate colour, the felspar crystals range up to an inch in length, and are grouped in crowded stellate clusters.

The minerals found in the rocky cavities are often of large size and great beauty. Zeolites of all kinds occur, chalcedony, chabasie, natrolite, stilbite, analcime, apophyllite, heulandite, also opal, both of the common and fiery variety; the latter is said to occur in a high mountain not far from, and to the east of, Leinum lake.

Two phenomena, as far as we know unique, were noticed, one on Naalsö, the other on Svinö.

Firstly: On the south-eastern coast of Naalsö there is a layer of 60 to 80 feet of dense doloritic lava. This layer is, broadly speaking, horizontal, and forms rudely shaped vertical columns of large dimensions. The columns, varying in thickness at different heights, present a wavy contour, and are split up again in secondary columns, which lie horizontally and at right angles to the wavy sides of the primary columns.*

Secondly: The north-eastern cliffs of Svinö show peculiar holes of various size, perfectly circular, from half an inch to 2 feet in diameter. These round holes are the sections of perfectly straight horizontal tubes looking exactly like artificial bore-holes. They occur at various heights, but, generally speaking, not much above sea-level. Some of the wider ones were at least 15 feet long, and all were perfectly straight. Whether they are long drawn-out vesicles of unusual size, or how they have come about, is at present an open question.

The general arrangement of the strata of all the islands is not very far out of the horizontal line. The dip is seldom more than 3° or 4°; only Suderö and Myggenæs have a steeper dip.

The cliff scenery is grand in the extreme. The rocks are cleft by vertical mastercracks, which form huge columns often extending to the whole height of the cliffs. Very frequently we find the cracks filled by injected dyke masses. These dykes have the typical horizontal columnar arrangement, and often branch into side injections. Seldom wider than 3 or 4 feet, they are most favourable starting-points for the attack of the destructive forces which are constantly at work to lay low the lofty cliffs of the weather-beaten coast-lines. Often we find that the sea washes out these injected masses to a height of about 30 feet; gradually a cave is formed, or a whole series of caves, until in time a cliff becomes completely undermined, and ultimately large masses break down and disappear (Fig. 5).

On the other hand, subaërial erosion is equally powerful in its destructive work. Frequently we saw the rocky cliffs split down vertically, and many a time did we notice huge cliffs slid down after the manner of a fault, along the coast-line partly in the water, the upper part leaning upright against the rock from which they had parted. In this way

* For further details, see *Proceedings Liverpool Geol. Soc.*, 1895, p. 302.

remarkably fine geological sections are revealed of over 2000 feet in height, and often so fresh that every detail of structure, every dyke, every lava-flow, every cavity, the dip, the occurrence of laccolites, etc., can be recognized with perfect distinctness.

Coal has long been known in Suderö. It has been worked there repeatedly, but never with any satisfactory financial result. The Danish geologist Johnstrup, who died last year, has published the best existing account of the occurrence of coal in Suderö. This summer (1895) a new survey has been made, and from private information I hear that for



FIG. 1.—VIEW FROM LEINUM LOOKING SOUTH. THE CONICAL ISLAND IN THE MIDDLE DISTANCE IS KOLTER.

the future the working of the Suderö coal-seams promises to be a commercial success.

In Myggenæs, which had the reputation of possessing coal, we actually found some in two horizons, the one close to the landing-place, and the other at an altitude of about 1300 feet. The coal of Myggenæs is mostly of a glossy kind, almost like jet; the Suderö coal is in some parts glossy, in others brittle and soils the fingers.

Signs of glacial action are of frequent occurrence, but the influence of subaërial and marine erosion tends to efface them rather rapidly. Roches moutonnées may be seen throughout the whole group of the islands up to a certain altitude; excellent examples are found near Quivig, on Stromö, and along the western coast-line of Osterö, opposite

Qualvig, down to Eide. Well-preserved glacial striæ can be seen in Suderö (Fig. 7); glacial mounds also in Suderö, Svinö, Osterö, Stromö, etc.; boulder clay was noted in Trangisvaag, Svinö, Fuglö, Borö, etc.*

From these observations there appears to be no doubt that the islands had a glaciation of their own, a conclusion which is inconsistent with the hypothesis of a big northern ice-cap. The remark in Prof. James Geikie's paper,† that there has been an ice-sheet coming from the northern group and intruding on the north of Suderö, will require a good deal of evidence before we can accept it, since we find everywhere the signs of local glaciation well pronounced.

A striking feature of the Færoes is their steep mountainous appearance. Hardly anywhere do we find flat parts, Thorshavn being almost alone in this respect. On the other hand, cirques as fine as could be found anywhere are of almost constant occurrence. Often these cirques reach high up to the top of lofty peaks, *e.g.* in Vaagö; sometimes we see one cirque above another, forming a sort of terraced valley, *e.g.* in Suderö, at Howe; sometimes the floor of the cirque reaches the surface of the water, *e.g.* at Tjornevig, on Stromö; and often a broken-down cirque is indicated by a few huge fragments, which testify to its original gigantic size, *e.g.* the island of Kolter (Fig. 1). A remarkable instance of this is also given in the case of Tindholm, the Drangar rocks, and the south-western cliffs of Vaagö, where a whole cluster of islets may be reconstructed into one large cirque (Fig. 6).

The *climate* is equable, the Gulf Stream preventing extreme heat in summer and cold in winter. Fogs are very frequent, and the annual rainfall is given as ranging from 70 to 80 inches, with 270 days of rain, *i.e.* three out of every four. Storms are also frequent, and to them is mainly due the absence of trees, there being but little soil to give hold for roots.‡ That there have been trees of a fair size in former times is shown by the fragments of stems and roots found in the bogs which yield peat. Probably these sites have been more sheltered in the past.

The journey undertaken in July, 1894, was favoured by exceptionally fine weather, and we were enabled to see more on that occasion than has been vouchsafed to nearly all previous travellers. Our desire to reach the easternmost isles—Svinö and Fuglö—could easily be realized. Equally successful were we in a visit to Myggenæs, the most westerly island, which, as far as I could ascertain, is inaccessible except on rare occasions.

When nearing Suderö, the usual veil of fog enshrouded the island,

* For particulars, see the *Glacialists' Magazine*, June, 1895, p. 1.

† *Trans. R. Soc. Ed.*, 1880, xxx. p. 217.

‡ A climate of this description must, on the whole, prove rather unpleasant even to the natives. As for invalids, an indispensable requirement would be good hotel accommodation. But even if there were any hotel existing, these highly interesting islands, so attractive for the tourist, could hardly be recommended as a health resort.

and made it impossible to make out exactly which bay we were to enter. Several bays, almost identical in appearance, open towards the east, and it was excusable that our steamer entered the Vaagsfjord by mistake. Soon we were noticed by some of the inhabitants, who sent a boat to meet us and to tell us where we were. There was no difficulty after this in entering the bay of Trangisvaag.

We were, however, not permitted to land at once. It happened that the governor of the islands was one of the passengers of our steamer, which had sailed from Copenhagen and called at Granton. In Leith and Edinburgh some cases of small-pox had been reported; hence we hailed from an infected port, and had to fly the yellow flag. Such a



FIG. 2.—BAY OF KLAKSVIG LOOKING NORTH. THE PYRAMIDAL MOUNTAIN ON THE LEFT REPRESENTS THE SOUTH END OF KUNO.

precaution may seem over-careful in our own part of the world, but it appears that any infectious disease introduced into the Færoes is apt to spread amongst the whole population with great rapidity and severity. Similar occurrences are reported of other isolated parts, *e.g.* St. Kilda, etc.

The governor, with true consideration for the people in his charge, had, soon after leaving Granton, insisted upon the revaccination of all those who wished to land in the Færoës and had not been vaccinated within the last six or seven years. When, therefore, the doctor of Trangisvaag had visited our steamer and found everything in order, the quarantine came to an end.

As soon as this became known, a number of native boats approached the steamer to receive any cargo intended for Trangisvaag. These cargo-boats are broad and heavy, and are manned by three or four men. When all the cargo had been discharged, the shipping of "export goods" began, consisting almost exclusively of dried fish. This is a somewhat slow process, as almost every fish is handed singly into the steamer. But time seems not very valuable in high latitudes. At last a peculiar piece of cargo had to be taken in, viz. an invalid, who,

suffering from necrosis of the leg, was hoisted on board in a coffin-shaped box well stuffed with bedding. His destination was the little hospital in Thorshavn.

After passing the new lighthouse of Trangisvaag, erected in 1893, we see before us a cloud-capped island rising out of the sea, and appearing, in the glow of the setting sun, like a smoking volcano, the conical "Lille Dimon," one of the rocky isles inhabited only by sheep. As we steam past the cap lifts, and the flat top of the island, so characteristic of the trap formation, becomes visible. The sea is boisterous, and four hours' heavy rolling and tossing are brought to a welcome end on entering the bay of Thorshavn, bounded on the north and west by the island of Stromö, and on the east by the long island of Naalsö.

In Thorshavn we find our guide and interpreter Peter Haraldsen, whose services we had procured by letter some time before. His handsome face, fair hair, bright expression, and general external appearance, make him quite a representative type of his countrymen.

The Færoese are the direct descendants of the Vikings, whose language and amphibious habits they have inherited. Their language is easily understood by the Icelanders, but does not, like Icelandic, possess a rich literature; it is to all intents and purposes only a spoken language.

The Færoese dress consists, for the men, of a peculiar cap, usually of a blue and red striped woollen material, a dark brown woollen jacket, knee breeches, grey stockings, and shoes of undressed cowhide for rough wear, or of dressed calfskin for better wear. These shoes are worn by the natives of both sexes and all ages, and are tied above the ankle with a woollen cord, white for men, red for women. All these articles of dress are home-made from beginning to end. The women's dress shows no characteristic difference from that of our own country. The people have a bright, intelligent look, and often a great deal of beauty is seen, especially in the men and the children.

Arrived in Thorshavn, we paid a visit to our old friend Consul Hansen, who most hospitably placed his house at our disposal, and, with his amiable spouse, did all in his power to make our short stay in Thorshavn pleasant. His house is situated on the rocky promontory which divides the bay of Thorshavn into two unequal parts.

We now propose to take a stroll through the "town." Thorshavn, the capital of the islands, the residence of the governor and other officials, has a population of about 1300, with a big church, a new stone-built school, and the fort. Starting from Consul Hansen's house in bright sunshine, we have before us a characteristic Færoese sight—the rocky ground around the house is used as a drying-place for fish. Fish we find everywhere on such a day—on the little open space on the other side of the bay, on the hill on which the fort stands, and along the shore. On the latter we find women washing and cleaning some that have just been brought to land.

We now enter the main street, a narrow way leading between houses of characteristic appearance. The foundation is very simple, large and small blocks of rock being piled together into a wall; often a huge outcropping rock, planed and scratched by glacial action, is utilized for such purpose, and any interstices in that part of the house-walls are filled by imported mortar. The main portion of the house is made of planks, also imported, and generally tarred. The roof is formed first by rafters; on these the bark of Danish birch is spread and fastened, and a layer of grass sods is placed on the top, giving the roof an appearance of great rusticity.

In this narrow street we found the house of the present "sysselmand" and post-master, Mr. Müller, for many years the representative of his

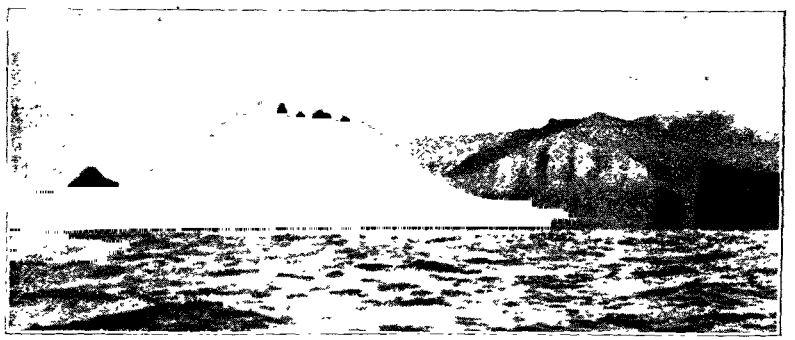


FIG. 3.—TINDHOLM FROM SOUTH.

native country in the Danish parliament. An excellent linguist, he is well known to naturalists by his collections of eggs, birds, minerals, etc.; and he has been an ever-obliging help to most of the few travellers in the Færoes.

Our stroll leads us to a small open space surrounded by houses of unusual picturesqueness. Very striking are the chimney-stacks, consisting mostly of a wooden shaft, sometimes enveloped in straw. Everywhere the windows are large, and hinged so that they can be opened, in this respect contrasting favourably with the houses in Iceland. Often a fine array of flower-pots, roses, carnations, mignonette, etc., adorns the window-ledges; and here and there a small flower-garden, a few yards square, has a gorgeous display of large red poppies, stocks, and other familiar flowers.

Up and down we follow the main street, the houses being built, not to make a terrace, but placed anyhow. Occasionally a "side street" attracts our attention by its picturesqueness: a staircase formed out of the solid rock, leading to a small lath house, which apparently blocks all further progress. These lath houses are used as "larders," in which the flesh of sheep is hung to dry. Exposed to the free access of air,

the meat is soon covered by a dry crust, which is said to keep the inside perfectly fresh and sweet for a long time.

Often we notice long sticks on which rows of fish are strung, forming the drapery of a gable.

The small brook which runs through the town was particularly dry during our visit; a pretty stone bridge leads across. Higher up the brook is used by the women for washing clothes. We found in the rocky bed several round holes, which one of my companions felt inclined to interpret as "potholes," or glacial mills. I was somewhat sceptical about them, and at last elicited a different explanation of their origin. It appears that the Færoese are well acquainted with the dyeing properties of various lichens. After maceration, the lichens are pounded with stone pestles on a slab of rock, and, in order to have water near at hand, the process is carried out on the elevated parts of the river-bed. By constant pounding these pseudo-potholes have attained their present size and shape—an interesting warning not to be led into a trap by a scientific explanation where the possibility of artificial causes are possibly responsible. It may here be mentioned that all their woollen garments are dyed as well as manufactured by the Færoese themselves.

A little further on we see a brooklet bridged over by a grass-covered house, and close by an old water-mill with vertical wooden wheels after the style of a turbine, the water on the occasion of our visit being completely absent. Here we met one of the only two horses that we saw on the islands. The horses, hardly used at all, are very small and shaggy, and resemble Shetland ponies. As there are scarcely any roads at all, and all traffic is carried on by boat, the horse is an encumbrance and practically of no use. The owner of this one, a particularly handsome Færoese, found no market for him when he offered him for sale.

Passing the fine new stone-built schoolhouse, we come to the church. A glance within shows us the spacious though rather bare interior, broken by a balcony. On either side of the altar is an old tombstone, the one to the north with an old Danish inscription, the other with remnants of a much-weathered design. We proceed further and reach the governor's house, a stone building, quite imposing by contrast to its surroundings. Situated on the brow of a hill, it commands a splendid view across the bay, and has the finest garden in the islands.

From there it is not far to the "fort," an insignificant structure which serves as a bridewell. In its grass-covered grounds we see four interesting old cannon, which are now only used for peaceful salutes on the birthday of the King of Denmark.

Opposite the fort is the island of Naalsö, a long narrow ridge stretching from south to north. Naalsö is well worth a visit, especially to the geologist and mineralogist. There is only one settlement in the northern part, Eide by name, a thriving village. On the southern

extremity a lighthouse has been recently erected. An isolated rock south of the lighthouse shows clearly by its profile that it once formed part of the main island; how the eroding action of sea and weather has carved out this rock is well illustrated by the natural arch just below the lighthouse. To this sea-worn perforation the island owes its name, Naalsö being the Danish for Needle-island. It is easy to understand how in time the site of the present lighthouse will be separated from the main portion of the island, and form a stack similar to the one now existing south of it.

In the south-east corner of Naalsö we find the peculiar rock formation mentioned in the introduction.

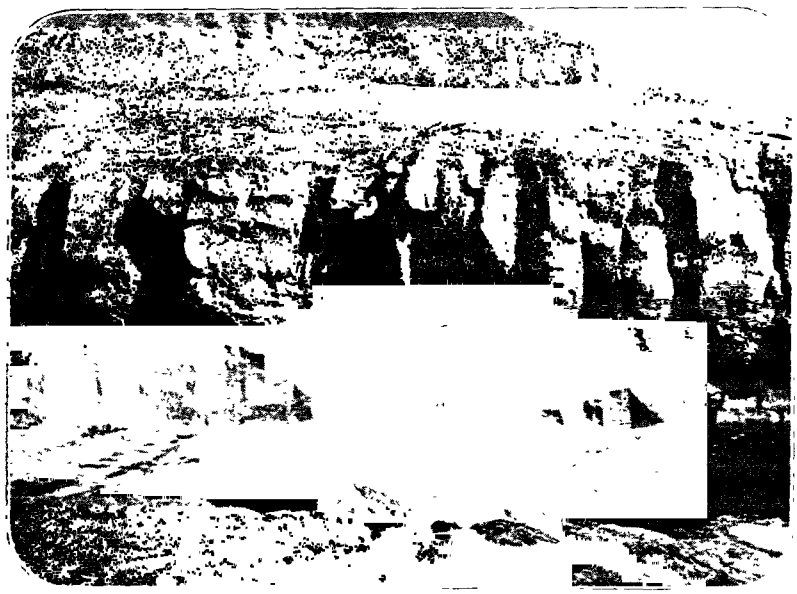


FIG. 4.—MYGGENÆS—LANDING-PLACE WITH BOAT.

We now visit the eastern group of islands, and start from Klaksvig, a small but important settlement on the island of Borö. Klaksvig is situated in a well-sheltered fjord, difficult of access for a large steamer, but well protected against rough weather (Fig. 2). The settlement consists of a number of houses mainly on the western side. Towards the north the pyramidal end of the island of Kunö forms a stately background, showing clearly the horizontal layers of the trap formation. Looking south-south-east up the fjord, we see the end of the bay formed by a low isthmus, a col, on which are situated the church and the schoolhouse. A peculiar feature in the village is a long wall, reaching down from one of the houses to the water's edge. This

wall attracts our attention at a distance by a number of regularly distributed white spots, which, on nearer approach, are found to be the skulls of the small whale called "Grindeval"—*Globiceps melas*. This whale measures four to six yards in length, and occasionally visits the fjords in large numbers, where it falls a prey to the united strength of all the available male population of the islands.*

After exploring the Klak, the mountain above Klaksvig, where some fine specimens of opal were collected, we prepare for a visit to Svinö and Fuglö. Crossing the isthmus, we meet the boat and crew awaiting us already. In fine weather such a sail is delightful. The boats are built with stem and stern alike for convenience in landing, and are manned by six, eight, ten, or twelve men. The oars are long, with narrow blades, not more than $2\frac{1}{2}$ inches across, and are fixed with thongs of dried whaleskin, so that they do not feather. The reason I heard given for this was that during the long stretches of rowing—sometimes six to eight hours without stopping—feathering would be too fatiguing, and the narrowness of the blades reduces the resistance of the air to a minimum. A sail, in some cases two, can be set; but it can only be used when the wind is in a favourable quarter.

A glance at the coast-line shows that, in case of capsizing, no possibility of escape would be left, the islands being mostly girt by overhanging cliffs extending for miles. Keeping well inshore owing to the tidal currents, this part of our journey would have been somewhat monotonous had we not had frequent opportunities, just there, of watching the behaviour of that peculiar bird of prey, the lestris. This gull, unwilling to dive into the water for its own food, closely watches the graceful tern, *Sterna arctica*, and, as soon as it sees the latter catch and swallow a fish, it persecutes and frightens the bird until the fish is disgorged and dropped, the lestris catching the dainty morsel while still in the air. Though disgusting for more than one reason, the whole act is done with such surprising skill that one cannot help admiring the mean robber for its adroitness.

After a few hours of hard rowing, we reach Svinö from the south-east. The little village is situated on the slope of a col between the two blocks of mountains which form the island. Ample traces of glaciation are found on this isthmus—moraine hills, boulders, roches moutonnées—all more or less well preserved. Fairly high up is the church, a building much larger than we had expected to find in that secluded spot. It has a fine altar-piece, copied from a well-known modern Danish picture.

* For want of time, I cannot here enter into the mode of capture employed. I may, however, mention that the number of whales caught seems greatly exaggerated in the descriptions given of late. In a recent paper (*Verh. der Ges. f. Erdkunde zu Berlin*, 1894, No. 6, p. 324). Prof. Moebius gives the number of globiceps caught in the Færoes annually as 50,000, whereas the actual number caught during the ten years from 1885 to 1894 was 4873, or about 480 per annum.

In spite of the heavy fog which descended on Svinö, we tried a visit to Fuglö, the easternmost island. From the distance we just recognized through the mist the form of a broad cirque, steep on all sides, and accessible only at its apex, where it touched the sea-level. When nearing Hattervig the fog lifted, and revealed the great height of the eastern cliff, the western cliff being not much lower. The landing was not quite easy, the harbour being a sloping rock surface of uneven amygdaloidal basalt, intersected by numerous dykes, and rich in zeolites.

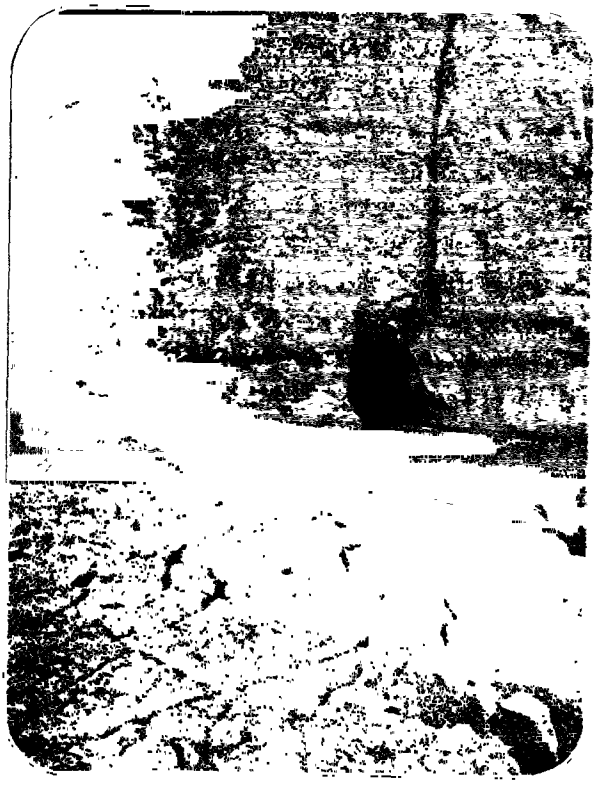


FIG. 5.—CLIFF SOUTH OF SAXEN (STROMÖ), SHOWING THE WEATHERING OF DYKES AND FORMATION OF CAVES.

From the harbour a grass-covered slope leads to the village. The little church, like most Færoese churches—even the very smallest—has two entrances, one on each long side; not so much with a view of easy access, but in order to keep the weather side closed on the frequent occasion of stormy days. The village itself is of primitive appearance, some of the houses looking somewhat like earth huts. There are better houses as well, *e.g.* the house which gave us most generously that hospitality which is such a pleasing feature for the traveller in every part of the Færoes. This house has, perhaps, the most picturesque of

the many quaint rooms we saw in the islands. It is a sort of kitchen, a large square room, the ceiling low, the floor of earth; along three sides of the room are seats with beds let into the wall; the fourth side is occupied by a huge hearth with beds on both sides. In the centre of the hearth was a wooden box, about four feet square, half full of ashes, and used as a fireplace. Over the glowing turf hung a kettle, suspended by a rope from a beam span across the primitive chimney. All sorts of foods were suspended therein to dry in the smoke, while a large assembly of the family and their friends sat chatting round the fireplace.

On our way back we found the skull of a grindeval and other parts of the skeleton. Not very far from the landing-place we noticed, fairly high up on the rocks, large pieces of driftwood, one completely riddled with teredo borings while floating in the ocean.

In this, and also in a few of the other islands, a peculiar kind of anchor is used, made of a large piece of basalt rudely hewn into a four-sided prism. The flukes, four in number, are formed of two long iron rods bent into appropriate shape. They are very interesting, inasmuch as stone anchors are not frequently used in other parts of the world at the present day, *e.g.* on the River Plate; they have evidently been introduced into the Færoes by the Vikings.

We now leave the eastern group and turn towards the west. Our goal is Myggenæs.

The difficulty of visiting Myggenæs consists in the almost complete inaccessibility of its shores. Only under most favourable conditions of weather and wind can a landing be accomplished, and that solely at one single point near the western end of the south coast. So uncertain and dangerous is the process of landing there, that occasionally, after landing has been effected, it may be impossible to embark again for three or four months. This interesting prospect was, however, in our eyes only an additional charm to the many attractions of Myggenæs. On the morning of our intended journey the weather was not favourable. The sea was running high, and our boatmen did not dare to row us from Leinum out into the open sea, and only brought us across the fjord, so that we had to walk overland on the island of Vaago until we reached Midvaag. There we secured a bold and muscular crew of eight men, who promised to try how far they could venture. They did not give us much hope of reaching Myggenæs, still less of being able to land. The scenery along the south coast of Vaago is very imposing with its vertical or overhanging rocks, *e.g.* Trelle Nypen. We pass the Busdali-foss, the largest waterfall in the Færoes. The water, the outflow of the largest lake, "Sörvaagvatn," falls in a few cascades over the layers of basalt, forming a regular staircase. From time to time the ocean swell sends up the foam of its breakers from below to meet the waterfall halfway. Owing to the state of the tide and wind, we have to leave the shore

and row out to sea. In the misty distance we see Myggenæs before us, rising out of the water dim and mysterious. As we come nearer after a few hours of persevering rowing, we perceive the western extremity to be separated by a narrow crack from the main island, and we now steer straight towards that point. At last we approach the harbour, a small bay opening south, and bound on east and north by perpendicular cliffs about 80 feet high, while the western side is formed by steeply sloping seaworn rocks, over which the furious waves break in white foam. Our boat had been observed from the island, and when we neared the harbour the natives had gathered on the top of the vertical cliff (Fig. 4) and shouted to our crew. The roar of the surf made it impossible

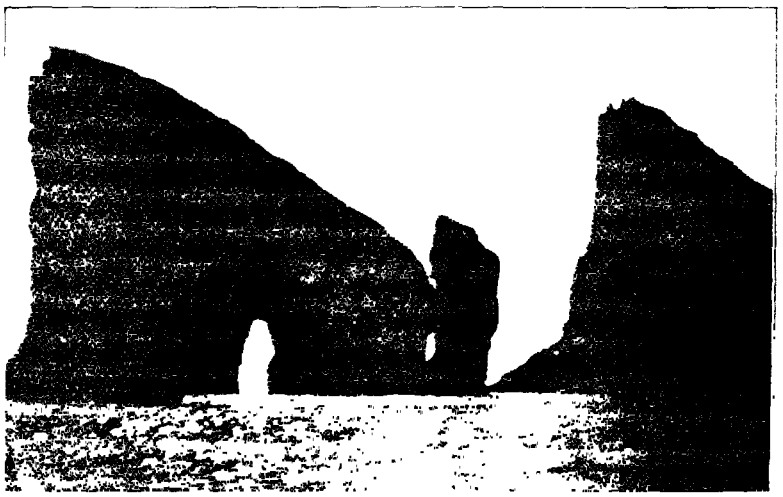


FIG. 6.—DRANGAR AND TINDHOLM FROM NORTH-EAST, THE UPPER SURFACES GIVING PROFILE OF CIRQUE.

to understand what they said, but Peter translated their gestures by informing us that it would be necessary to haul us up the cliffs by ropes—a performance which we did not quite fancy. At our request our men tried again and again to land us on the sloping rock ledges, and finally this was effected with the help of some of the natives. We were pushed or rather thrown out of our boat one at a time by our men, and received by the natives on the rocky ledge. In this manner we set foot on Myggenæs, not quite dry, but certainly much less damp than we might have expected.

After we had landed, the men had hard work to get the boat on the rock, the waves dashing high up and threatening to pulverize our little craft; but finally the *Frigyjarin*—that was the name of our boat—was safely landed and drawn about 80 or 100 feet up the rock, so as to be safe from any sudden squall that might spring up.

Thus at last had we gained Myggenæs after twelve hours' struggling;

when it would be possible to return nobody knew. Nor did we much trouble about that for the moment; we had safely landed our cameras, barometers, and other goods, and so far we had no cause for complaint. As it was already late, we had only a short ramble in the immediate neighbourhood of the village, the only settlement on the island, situated some 200 feet above the sea and near the landing-place. It comprises about 30 houses grouped round a pretty little church, and sheltering some 150 to 200 souls.

On the following morning the weather had become beautiful, a clear sky and a bright, warm sun giving great charm to the grand lonely scenery. In favourable light the harbour was photographed, and then we set out on a systematic examination of the island, with the desire to reach the highest point in order to take the barometric reading.

As we ascend we see below at our feet towards the west the island of Holm, separated by a narrow gap from the main island. The cañon-like gap which separates the two is spanned by a wire rope on which a cage runs, for the convenience of the men when looking after their sheep. In all probability this gap owes its origin to the removal of a dyke which formerly occupied that site.

Plenty of sheep enjoy the short but fine grass on the south-western slope of Myggenæs. At a height of 900 feet we get a glance at the magnificent coast scenery of the northern shore. The thick alternating layers of lava and tuff have a greater dip in Myggenæs than in any of the other islands, the dip reaching 18° in the western part. These rocks form nearly vertical walls, that make landing utterly impossible. Many a fine stack, 200 or 300 feet high, stands like an outpost a little distance from the cliffs, testifying to the destruction which goes on there continually.

Large colonies of sea-birds inhabit the rocks, puffins being plentifully represented in this locality. They are quite tame, and are not frightened when approached within a few yards.

Ascending still higher, we find an intrusive sheet of basalt 60 to 80 feet thick. The columns are certainly the finest we saw in the Færoes. Reaching the summit of Myggenæs, our exertions are rewarded by a magnificent view. Toward the north-east, the cloud-covered cliffs of Stromö; to the east, the western bay of Vaagö, the Sörvaagsfjord, with Tindholm and Gaasholm in front of it; then further, almost lost in the blue haze of the horizon, Sandö, Skuö, Store Dimon, Lille Dimon, and lastly Suderö.

The barometric reading, compared afterwards with sea-level, gave an altitude for the summit of Myggenæs of 1750 feet.

Towards the east a magnificent cirque lies beneath our feet, and we can see from our position that the coast is as inaccessible on the south side as on the north.

Signs of glaciation were noted up to a height of 1500 feet. Above

that the rocks are craggy, and angular fragments of stone fallen from the higher points are scattered in profusion. Just above the limit of glaciation a bed of brown soily substance, 10 to 15 feet thick, and strongly impregnated with humus, forms the surface; the grains are extremely small and regular, and no traces of big fragments—not even as large as a pea—were noted. A rude attempt at stratification could be made out, not very pronounced. This soil has probably been formed by chemical disintegration of the basalt rocks *in situ*.

At an altitude of 1300 feet we found coal in small quantities; also again at a much lower level, close to the landing-place. The inhabitants



FIG. 7.—GLACIAL STRIÆ AT TRANGISVAAG.

brought us fairly large pieces of coal found by them at the bottom of a cliff on the southern coast; this coal is highly glossy, and breaks with conchoidal fracture.

The day being so fine and favourable for embarking again, we thought it wisest to seize this opportunity of returning to Vaagö, as we did not relish the idea of remaining in Myggenæs for an indefinite time.

Thanks to the perfect day, we found the embarkation much easier than the landing on the previous day. With the help of the swift tidal currents, Myggenæs was soon left behind, and we reached the fantastic-looking island called Tindholm (= tooth island) (Figs. 3 and 6). On the previous day we had seen it at a fair distance from the south, the Drangar, or stacks, eastwards. This day we passed on the north of Tindholm, in close proximity to the island. Not a breath of wind could be felt. Nevertheless, the tidal currents were sufficient to toss our little boat up and down so much that it was hardly possible to stand up or to take any

photographs. The scenery was, however, too fascinating not to make some attempts, which happily turned out successful. The profile of Tindholm resembles the tooth of a saw, and its serrated upper edge, seen broadside, equally justifies the name given to the island.

It requires enormous exertions to force a little open rowing-boat through the powerful mælstrom on this rocky coast, but our men are experts of no mean order, and we pass safely the two Drangar, huge stacks separated from Vaagö by the eroding forces of sea and weather. One of these stacks is narrow; the other, broader, is already perforated by a natural arch, and will ere long become divided into two stacks, and in time share the fate of complete destruction with Tindholm, Gaasholm, and finally the rest of the islands (Fig. 6).

Both from the north, where the slanting upper surface of these stacks can be seen, and from the profile, it is clear that Tindholm, the Drangar, and the southern peninsula of Vaagö, formed once one large cirque, of which only a few shreds are left standing—sufficient, however, to reconstruct its original form in our mind's eye.

We leave this part of the Færoes—possibly the most picturesque, as it is certainly the least known—and, after passing the Witch's Finger, a pointed rock separated from the parent cliff by a vertical rent, and looking ready to fall into the sea, we reach Quivig, on Stromö.

Journeying on land, we come to the beautiful Leinum lake, perfectly circular, and situated in a district rich in exquisite zeolites. In the background of the lake is situated a high mountain reputed for its wealth of opal, both common and fiery. Unfortunately, our limited time did not allow us to verify this report.

High up, to the south-west of the lake, the large basaltic intrusive sheet of Skellinge is seen. A little to the south-east of Leinum lake, the summit of the col is reached. This point is situated on the main parting-line of ice and water mentioned in the beginning of this paper. Not very far off we find a huge boulder left by the ice close to the watershed, which it is hardly possible to mark out with exactness on the flat-topped col.

The farm at Leinum is in a well-kept condition. Our attention was attracted by a fine specimen of hand-quern which we saw in actual use. These querns were met with in various places, *e.g.* Thorshavn and Svino.

From Leinum we take a boat, and, within view of the islands of Hestö, Kolter, and Vaagö, we row northwards to the bay of Vestmanhavn, which forms the finest harbour of the islands. The coast-line is sloping and well covered with grass; a brook tumbles down in gentle cascades on the south-east side of the bay. The tidal whirlpools in this fjord are very remarkable. I noticed in several places large circles, about 30 yards in diameter, perfectly smooth, their level nearly 6 inches above the surrounding water. At the circumference of these smooth

plaques a regular cascade was formed, where an equalization of the level of the water was attempted, without success, owing to the great force of the inrushing tide.

From Vestmanhavn northwards, along the western coast of Stromo, the most imposing cliff scenery of all the islands is seen. For many miles the rocks rise perpendicularly out of the sea to a height of between 1500 and 2400 feet. All along these miles of vertical cliffs, each of which presents a magnificent geological section with every detail of structure recognizable, there are not more than two or three spots where a rowing-boat can land or a foothold be found in fine weather. Even then there would not be the slightest chance of scaling the cliffs; while in rough weather landing is altogether out of the question.

These cliffs are the nesting-place of countless myriads of sea-birds. Already from a distance their presence can be recognized by the white patches, denoting the abode of the terns, kittiwakes, puffins, gulls, alks, etc., which, on our nearer approach, fill the air with deafening cries. The more or less horizontal strata of the rocks are of various degrees of hardness; the softer parts weathering out, ledges and hollows are formed which are used by the birds as nesting-places. The birds often crowd together to such a degree that it seems as if there were no room left for a single bird more. These bird-rocks form a valuable property for the parish to which they belong. At the time of hatching, the men band together and go fowling on the cliffs. This is a most dangerous occupation, and it is no wonder that many of the strongest and healthiest of the population fall a victim to it every year. Three or four of the men approach the top of the cliff from the land side; then one of their number is let down by a rope, and, half dangling, half crawling, he reaches the birds' habitat. Then, with a large net fixed on a pole, he rakes out of the nests whatever he can reach. The frightened birds become entangled in the meshes, and are caught by the fowler, who twists their necks and throws them down into the water, where they are picked up by boats in waiting. In this way, thousands and thousands of birds are killed and stored away as food for the winter. This is the only way they are caught; shooting is carefully avoided, lest the report of the guns should frighten them away altogether. We were fortunate enough to witness this bird-catching in various parts of this coast; also in Myggenæs, Svinö, and Naalso.

The west coast of Stromö gives excellent opportunities for studying how the erosion by sea and weather takes hold of these gigantic walls, which look as if built for eternity. The caves, which are produced at the sea-level by the washing out of dykes and cracks, have often most fantastic forms. Sometimes they are arched like a Gothic vault, resembling Fingal's cave or Nuremberg architecture; in other parts we see a flat horizontal roof covering mysterious inlets, reminding us of the entrance to the lethal chambers of the Pharaohs. In many of

these caves seals used to breed, but the irrational way in which the natives slaughtered them has finally driven them away altogether.

As we row further north we encounter many a fine example of rocks that have broken off and slid down as stacks, which are now separated from the main rock by a narrow rent barely wide enough to admit our small boat. A visit to the interesting old harbour of Saxen was carried out under some difficulties. It is now so completely silted up that even our little craft could not enter more than a hundred yards, and we had to wade through the banks of finely ground grains of basalt; not a grain of quartz could be found in spite of careful searching.

At last we see before us the steep cliff of Myling head, at the northern extremity of Stromo. To the west this cliff drops into the sea as a straight wall nearly 2400 feet in height, while its eastern side is formed by the gentle slope of a beautiful cirque, dipping to the level of the fjord at Tjornevig, whence it can be scaled without danger.

Rounding this corner, we enter the fjord of Eide, where fine examples of roches moutonnées and striæ are seen on every hand.

Eide, a flourishing settlement on the north-western point of Ostero, has a fine church, and is one of those places where we found exquisite apophyllite and chabasie. From Eide we went up the fjord to Nyboder, where a Norwegian whaling station had been erected that summer. As the steamer was just out at the time of our arrival, we proceeded temporarily to Qualvig (= whale bay), a little further south on an inlet of the fjord. In this large bay there happened to be four "bottle-nose" whales which had strayed there, and were evidently in no hurry to leave. Most likely they had found an abundance of food, which had attracted them. When we arrived they had been there three or four days already. Northwards they could not escape, the "sund" being too shallow for them; and, as they had made no attempt to leave by the southern part of the fjord where they had entered, a large schooner had come from Thorshavn to capture them by means of a ridiculously small rowing-boat and a little rocket-harpoon. Needless to say, the efforts of this boat proved unsuccessful. The mode applied for the capture of the globiceps could not be applied; the nets with which the grindeval is imprisoned within the fjords are far too weak for such big game as the bottlenose, and would have been completely destroyed without hindering his escape in the least.

In Qualvig we had an opportunity of studying the interior of an old-fashioned well-to-do Færoese house. Very quaint is the stove—an iron box built through the wall of an adjoining room or kitchen, where it is fed, so as to heat both rooms with a minimum amount of fuel, which here, as almost everywhere in the islands, is peat. We often saw men carrying peat on their backs in big lath boxes, supported by a broad strap across the forehead. The beds in these farms are also noteworthy. Often they are let into the walls like berths in a ship,

after the Icelandic style. Similarly, we found they were capable of being telescoped; but while in Iceland the beds can be made shorter or longer, the Færoese beds, always rather short, can only be altered in width, being thus adapted to the inordinately spare or stout rather than to the short and tall.

From Qualvig we returned to Nyboder, where we joined the whaler. We went out with the steamer *Urd* on a three days' expedition, and were successful in harpooning and bringing home one of the largest specimens of the great fin whale (*Balænoptera musculus*). As, however, time is already too far advanced, the details of this exciting chase cannot be gone into to-night.

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Before the reading of the paper, the President said: There are probably several here present who will remember the agreeable evening which Dr. Grossmann gave us, now nearly two years ago, when, by means of his photographs, he conveyed to us such a very vivid picture of the Icelandic scenery, and brought out some salient points in the geology of Iceland. I think we may anticipate an equally pleasant evening now, while obtaining a knowledge of the Færoe Islands through Dr. Grossmann's photographs and his graphic descriptions. I will now call upon Dr. Grossmann to read his paper.

After the reading of the paper, the President said: I think the meeting will agree with me that I was not a bad prophet, and that we have spent a very interesting hour in making the acquaintance of the Færoe Islands. There are many points in what Dr. Grossmann has said which might lead to discussion, but I regret to say that Sir Archibald Geikie, who has for two years running visited these islands, is unable to be present. He has, however, written down what he intended to say, and has sent it to me. I think it will interest the meeting.

Sir A. GEIKIE'S communication: For two summers in succession I have visited these islands, and as I made the voyage each time in a steam-yacht, I have been able to circumnavigate the whole group, and to explore the greater number of its islands and fjords. Dr. Grossmann's paper recalls my own experiences and revives the very pleasant impression which both the islands and islanders have left on my memory.

The Færoes have a singularly uniform geological structure, and consequently a somewhat monotonous character of scenery. They are built up of level or gently inclined sheets of volcanic rock, which, however, is not "volcanic tuff," as the author of this paper seems to believe, but streams of once molten basalt. The tuffs, as in our own Hebrides, form a quite insignificant part of the whole volcanic series. These ancient lavas were poured out from numerous small vents, and not from any great central cone like Vesuvius. I was fortunate enough this summer to discover a row of these little volcanoes at the base of the western cliffs of Stromo.

There can be no doubt that, like the corresponding rocks of Antrim, Mull, and Skye, the lavas of the Færoe Islands were erupted on a terrestrial surface. They flowed over a wide plain, which they gradually heightened until its original bottom was buried under more than 2400 feet of volcanic material. The rainfall during that prolonged volcanic period was perhaps not very different from what it is in the same latitudes now. At all events, there was moisture enough to nourish abundant land-vegetation, and to fill with water the little hollows on the surface of the cooled lava-streams. Into these pools and lakes leaves from the surrounding woodlands were blown by the wind or washed by the rain, in such abundance as to gather among the silt of the water-basins into layers that became in the end beds of coal.

Eventually this wide plain or plateau of volcanic material sank down to some extent, so that its base is now concealed under the sea. Though I have diligently searched all round the Færoes for the original bottom or land-surface on which the basalts lie, I have never succeeded in finding the slightest trace of it. It has been entirely submerged.

But the most serious changes which have been wrought on the face of the Færoe plateau have been effected by the various agencies of denudation. By degrees its edges have been cut back until they now rise as stupendous precipices from the level of the sea. Its surface has been eroded into valleys, and as these have been depressed with the general sinking of the whole area, many of them are now occupied by the sea and form fjords.

These northern islands are thus a mere fragment, which has been cut into smaller fragments by the ceaseless progress of denudation. Their varied forms of surface are entirely due to waste, modified by the guiding influence of the rocks; and as these rocks are so uniform in character, the resulting topography naturally

remains constant throughout the whole group. So far as I have been able to ascertain, no rocks such as the gabbros and granophyres of Mull and Skye, which might have given a central core of high ground, with different features of scenery, have broken through the basalts of Færoe. The islands have no mountains, in the proper sense of that word. Their highest ridges are merely portions of the same universal plateau made up of nearly horizontal lavas. The endless straight bars of rock-terrace, so conspicuous along the coast cliffs, may be traced even to the loftiest summits of the interior.

There is one notable difference between the Færoe Islands and the Inner Hebrides. Owing, perhaps, to their more northerly position and climate, their sea-cliffs are less mantled with vegetation than our verdurous islands, and afford, therefore, more continuous sections of their geological structure. I have never seen such colossal precipices of volcanic material as those of the north-eastern islands—vast walls of naked rock, where every lava may be counted from the waves below to the beetling crests more than 2000 feet overhead. And nowhere in Europe are the lessons of denudation more eloquently enforced. At every turn new proofs meet the eye of the stupendous erosion which, out of an original plain of lava, has slowly excavated these fjords and sounds, sliced down these precipices, carved out these buttresses and alcoves, isolated these sea-stacks below and these cloud-capped pinnacles above. Apart from the interest of their volcanic history, these islands well deserve a visit from every geographer and geologist who would wish to witness with his own eyes the most impressive memorials of topographical changes, and to realize—yet more vividly, perhaps, than he has ever been able to do before—how gradually the scenery of our globe has been evolved, and how large a part of this evolution is due to the winds, rains, and frosts that seem to act so feebly in the sculpture of the land.

Dr. Grossmann gives a pleasant and faithful picture of the Færoese islanders. They are, as he describes them, fair-haired, blue-eyed Vikings, accustomed from their boyhood to live on the sea, daring climbers, active and intrepid boatmen, frank, helpful, and industrious, building many a bright and busy homestead in their sheltered creeks, and, in spite of the hardships entailed by a boisterous climate and a rugged and rocky soil, gaining a livelihood in contentment and peace.

The PRESIDENT: We have to thank Sir Archibald Geikie for so kindly sending us what he intended to say. I also regret that our old friend Colonel Feilden has written to say that he is unable to be present this evening. There are reasons for believing that there is a very extensive volcanic area extending from the Færoes and Iceland over the sea-bed towards Greenland. I remember, when in the *Valorous*, a line of deep-sea soundings was taken from Davis Straits to the coast of Ireland, and our average depth was 1700 to 1800 fathoms, with soft sand and globigerinous ooze. One day, on an Icelandic meridian, but far to the south of that island, we came upon a depth of only 600 fathoms, and brought up bits of volcanic rock, so that there was evidence of a mountain 7000 feet high, rising from the surface of the sea-bottom. I think it would be extremely interesting if a careful survey could be made of the sea bottom between the Færoe Islands, Greenland, and Iceland southwards to about the 55th or 54th parallel, so that we might have a knowledge of the configuration of the sea bottom over that area. We should probably find a series of volcanic mountains reaching to within 500 or 600 fathoms of the surface. There are many other points of great interest which have been told us by Mr. Grossmann, but I should have been glad if he could have given us more particulars of the fishing of the Grindeval when those whales come up the fiords. We have only now to pass a vote of thanks, which I am sure you will all cordially do, to Dr. Grossmann for his very interesting paper, and I am confident that you will instruct me to convey to him your warmest thanks.

JOURNEYS IN PERSIA (1890–91).*

By Captain H. B. VAUGHAN. 7th Bengal Infantry.

On arriving at Linga, I started in a native boat of five tons and sailed up the Clarence Straits between the mainland and the isle of Kishm. On the second day we arrived at Bandar-i-Khamir, a small port, near which are immense mangrove swamps. The inhabitants said that the salt river from Jena found its way into the swamp about 12 miles to the south-east of the town. Next day we resumed the voyage, and ran up the mouth of a salt river to the east of Khamir. This river is said to rise near Iskhanan, and flows past Fathura down to this point, and the river Dundil from Hormuz is said to join it just before it reaches the sea. The banks and flats of mud here were covered with thousands of sea-birds, varying in size from the adjutant down to the sandpiper. The return journey took us three days; then a gale sprang up, so we landed at Kung and marched into Linga, a distance of 4 miles. At Kung were the ruins of an old pirate stronghold, said to have been destroyed by our ships many years ago.

On April 12, 1890, after a stay of some days at Linga, on the Persian Gulf, I left it with a caravan of one horse, ten donkeys, two servants, and one Persian soldier. We marched for three days along the sea-coast, sometimes on the sands near the water. The shore was covered with myriads of large light-coloured crabs, which scurried away in a swarm before us into the sea, to emerge again after we had passed by a short distance. They looked like a hare moving over the ground when about 50 yards off. These crabs dig holes in the sand just about high-water mark, and pile up the excavated material in a small column in front of it. They spend part of their time in the holes. Passing the villages of Bostaneh and Mughu, which latter used to be one of the stations of the East Indian Squadron, we arrived at Charek, another village inhabited chiefly by fishermen, and then struck inland in a northerly direction, following up a watercourse through the mountains.

In two days we descended on to a plain and arrived at Jena, containing about 800 houses, and situated on a plain 1300 feet above the sea. I was met some miles from the town by the Khan of Bastak's servants, bringing with them their master's horse richly caparisoned with silver ornaments. I told them I couldn't ride on a Persian saddle, and they said that he would be much offended if I didn't. So we compromised matters by putting my saddle on his horse. Leaving the town, we arrived at the salt-water river Maheyrun, which flows into the sea at Bandar-i-Khamir. It was in flood, 70 yards broad, and very swift; so we stuck a stick in the water to mark its fall, and sat down to breakfast. In an hour's time we found it was falling

* Map, p. 124.

rapidly, and in another hour we transferred the baggage from the donkeys to the backs of some horses, and got it across dry; the donkeys swam over. Next day we arrived at Bastak, described in my former paper. The number of inhabitants is larger than that of Jena, but smaller than that of Lar, probably between three and four thousand. The governor met us with a large retinue of armed attendants outside his house, to which we adjourned, and was very friendly, as we had met before. The height of the town was about 1600 feet.

After a week's halt we left for Lar, and on the way passed Fathura, a village where there are sulphur springs which are at a temperature of 103°. The inhabitants said they were very poor, and that in winter they used to sleep in the stream to keep themselves warm, and in proof of this assertion pointed out stones in the water which they used as pillows. The march then lay up a valley near a river, on which stood Anwe, a village close to which are some flour-mills worked by a sulphur spring on the river's bank. The fish I noticed were all black. I shot several, which were good eating. I don't know whether their colour is attributable to the sulphur or not. The river, or rather stream, in question is said to come from Iskhanan, and to flow past Toderu into the sea near Khamir. We started next morning from Anwe with an honorary escort of fifteen musket-men and two of the khan's servants; crossing a pass we entered the Lar district, and marched over a plain to Hormuz, where we halted. My escort were all Sunnis, and the villagers inhabiting this and those to the north were all Shiahs. As I arrived with them, I was looked on in an unfriendly way, and until I had talked to them for some time and showed them my letters of introduction to the Governor of Lar, they would do nothing for me. Close by the town were the ruins of a city built of stone, which must have contained several thousand inhabitants. There is another Hormuz, a village on the road to Forg, and also the famous Hormuz near Bandar Abbas. After marching two more days through mountains, we arrived on the Lar plain, where a body of mounted horsemen met us and conducted us into the town, discharging their rifles and performing various feats of horsemanship as they circled in front.

I stayed in the Mehiman-Khana, a guest-house of the governor, who was Fateh-Ali-Khan, of about seventy years of age, a fine old man, with three grown-up sons. The town contained about 6000 inhabitants, of which 300 were Jews, which latter appeared to be in a state of great poverty and raggedness. There was a very fine bazaar built by the present khan, and a new caravanserai, also a Persian post-office. The great mosque was said to be 600 years old. There are a great number of old stone ruins about the place, amongst which are two fortresses and numerous aqueducts, all of masonry, and attributed by some to the Zoroastrians. There were a great number of date palms about, and some cultivation The governor was ill when I went to see him, and

I gave him some medicine to take. A Szed standing by said, "Don't take it; it may be poison." The governor simply looked hard at him, and replied, "What should he want to poison me for? What good will it do him? I will certainly drink it, provided it contains nothing forbidden in the Koran;" and on receiving this assurance took it. The only other Europeans remembered to have visited the place were Mr. Stack, Indian Civil Service, and I think a Mr. Butcher, of the Indian Telegraph.

After a week's stay as the governor's guest I left, and marched for Darab. My muleteers were all impressed by the governor, and on the second day we arrived at their village, Dah-Kuh, where I halted to let them cook food for the road. They were very anxious to stop and assist in gathering the harvest. A servant of the Khan of Lar here overtook me, with a couple of monkeys and a parrot he was taking to Darab for the governor's child.

In two days we arrived at the plain of Yezd-Khast, 3900 feet above the sea, where there was a large camp of a tribe of that name. As I rode up to the camp I saw there were nothing but women in it, and was told that the men had gone to the east to settle a dispute with some villagers. There are said to be extensive ruins near here. Next day we reached Hajiabad, after crossing a pass 4400 feet. The road was then over a plain about 3650 feet in height. On this for half a mile we passed through extensive ruins, amongst which were those of a fort; then on through camps of the Baharloo tribe of Arabs. We next crossed a river called the Rud-i-Ax-i-Rustam, which rises in a pool under a rock sculpture of Rustam, a few miles to the east of Darab. A masonry bridge called the Pul-i-Kosu was our means of passage. Here I said I would halt. On hearing this the muleteers swore and tore their clothes and jumped on their caps, saying I must be mad to halt in such a place, the scene of a battle only two years ago, and haunted by the ghosts of the slain, to say nothing of the Baharloos living close by; if I liked, they would leave the baggage and go on with their mules, but sleep there they would not. So I gave in, and marched on to a village on the same river, but on the Darab plain. This river is said to flow on to Fadumi, where it emerges from the hills as a salt river, and joins the one from Forg. It appears to round the northern extremity of a watershed consisting of mountains, and extending south as far as the Lar plain. Next morning we passed Kaleh-Darab, where there were some ruins on a high mound encircled by a very deep and broad moat full of wild duck; the moat is in the form of a perfect circle, and getting on for a mile in diameter. It is said to have been built by King Darius.

Darab is a large town of about 6000 inhabitants, situated at an elevation of about 4000 feet above the sea-level, on a fertile plain, and at the south foot of a great range of hills. There were a great many ancient remains in the neighbourhood, amongst which were the Ax-i-Rustam, a sculpture in high relief, which appeared to be Grecian, and

probably represents Rustam receiving the submission of some conquered people. The most remarkable feature in it is a chariot with a pair of horses of the antique type, from which a bare-headed individual clad in a tunic reaching to just above his knees has descended; he wears rather closely fitting pantaloons, which are quite tight at the ankle, and is attended by a crowd of clean-shaven, bare-headed, close-cropped, and almond-eyed individuals. Rustam, who is mounted on horseback and wears a helmet with a flowing plume, is placing one of his hands on this man's forehead. Behind Rustam are a crowd of people with long beards, who wear the Phrygian cap.

The horses, as well as the human figures, are well delineated, the various muscles being correctly shown, and the folds of drapery well executed. A large pond of very clear water full of springs lay beneath it, and in it lay fish of 10 or 12 lbs. which refused to take any bait whatever. The Mohammedan New Year's Day, *Nau-Roz*, was celebrated during my stay, and there was continual music in the shape of large drums and colossal foghorns, which played from the central tower just above my rooms. They also played during the night of my arrival, commencing at 11 p.m. and going on far into the night, but I was so tired that, as I told the governor in the morning, I had heard nothing. The governor was a Shirazi and most friendly, as was his son, with whom I used to go out shooting. He could shoot bustard from his horse while going at full gallop past them. A reception was held by the governor on New Year's Day, which was attended by all the leading inhabitants, who read addresses, and at which the troops in the station were drawn up and inspected.

Leaving the town, we marched over mountains for three days, ascending to a height of 7800 feet. At the twenty-eighth mile we arrived at the Kuh-i-Rudbar, where the river of that name rises in an immense cleft in the hills between cliffs 700 feet in height. The ground near on our arrival was covered with hundreds of tortoises, which soon hid themselves in the adjacent bushes. This river emerges on to the Darab plain, and is quite distinct from the Rustam river, and flows, I heard, in a south-western direction. Arriving at Niriz, I learnt that my former acquaintance the governor was no longer there, having been sent a prisoner to Shiraz, as his revenue was short. From Niriz I marched nearly due north, and in five days reached Herat-i-Kharah, a town containing about 1700 inhabitants, situated on a great plain 5800 feet above the sea. All the people, from the governor downwards, were the civilest and most obliging I ever met in Persia. I had a telescope with a 3-inch object glass set up, and the inhabitants used to crowd down every night to see the moon through it, and the excitement amongst the people was so great that even the governor's harem, closely veiled, were allowed to come down and look at what they were told were its mountains.

Leaving the town, we continued the march over the plain, passing

through the villages of Ab-Ali, Hara-Wajun, and Hashimabad. Leaving the latter, we descended slightly, and at an elevation of about 5400 feet crossed a strip of *kavir* one mile broad, and draining south-east on to the great plain of that nature where Rubat lies. Next day we marched to Chah-Mil, a noted haunt of robbers, who lie in wait in the surrounding hills for caravans. We numbered six altogether, and as I had guns for the whole of them, the sight of us would have probably been enough to frighten away anybody expecting an easy capture. It got dark before we reached our halting-place, and the party, according to the custom of the country, let off an occasional shot and shouted at the tops of their voices as we approached it.

Halting for the next day at the spring, we started in the evening and reached Kalvand, a small fort, before dawn, at an elevation of about 6000 feet. Three more marches along the high-road from Kerman brought us to Yezd, where I was met by some Parsi friends, and in a procession headed by a mace-bearer and some of the governor's servants entered the city. The changes since my last visit in 1888 were few in number, and I lodged in the same garden house belonging to Ardeshir-Meherban in which I had formerly stopped.

My route as far as this was by prismatic compass. The remainder of it was done with a plane-table from a base at Yezd, and from a triangulation near Teheran kindly lent me by Colonel Wells, R.E. The actual road was taken by compass and plotted on to the plane-table sheets, and frequent observations for latitude were taken with a small theodolite.

The heights were computed from the mean of three aneroid barometers, checked occasionally by the boiling-points of eight different thermometers whose mean was taken. The heights taken in 1888 were with one small aneroid only, consequently the former are the most trustworthy, though still only approximate, and, although the readings tally fairly well throughout, there are several considerable discrepancies, as, for instance, at Tut, which in 1888 I made 3140, in 1890 became 4585 feet; and although on the last occasion I was camped a good deal higher up beyond the village, in a garden, it does not account for the difference. At Anarak, again, not more than five or six days' journey further north, the readings at both periods corresponded closely.

As regards the number of the Parsis in Yezd, in 1889 they numbered 6737. Of these the greater number live in the surrounding villages, chiefly on the road to and in Taft, where they have 250 houses; and the villages of Zainabad (30 houses), Cham (50 houses), and Mubarakah (50 houses) are passed, as well as several other larger ones lying within 3 or 4 miles of the city. In all the above mentioned the population is entirely Parsi. They have several fire-temples in the city, but they simply consist of rooms in private houses and as unobtrusive as possible, so as not to attract the attention of the Mohammedans. There are several towers of silence about, one of which lies on the eastern

extremity of a chain of hills passed on the road to Taft, and there is another one out in the desert to the north of Kalanta.

The Parsis have several places of pilgrimage near Yezd, to which they resort at certain seasons. One which I visited, called Narakie, is on the south-west side of the Palangun hills, where there is a waterfall, and another one, called Chak-Chak, is at the foot of a lofty mountain of that name, and lies some miles to the right of the road between Yezd and Tut; there are springs in the place. When I arrived in the city, there were no Europeans living there except an Austrian dentist and his wife, who were just leaving after a few weeks' stay. On my return to the city in May, 1891, I found a couple of European merchants from Isfahan had opened branches there. The natives of Yezd never use ploughs, but dig up their fields, which must be a tedious process; indeed, I cannot recall the sight of a plough in the whole of Persia.

I employed a Parsi as servant during my stay in the city and its neighbourhood, and he proved firstrate as a cook and attendant, and very useful in a variety of ways with his race, amongst whom I was living. A fair number of them have been to Bombay and Karachi as merchants or servants, and often, when passing through their villages, people would come out and address me in Hindustani. They drink, but do not smoke, and produce excellent wine. Their aptitude for trade, of course, is well known, and I think that their success is a great deal owing to their marked preciseness and energy, in which qualities the Oriental is so often deficient. They are all obliged to wear dust-coloured clothes, and are not allowed to ride horses in the city. Their official head, however, had a special permit from Teheran permitting him to do both. The persecution they suffered in former times is a matter of history, but in recent years their condition has been immensely improved.

Yezd is a centre of the opium trade, and about 4000 chests are exported annually *viâ* Bandar Abbas, from which port they are shipped to Bombay.

I arrived at Yezd on June 12, 1890. The weather had been getting warmer, and the thermometer, which stood at about 80° Fahr. at noon in April when at Lingah, on the coast of the Persian Gulf, was now at 93°, and travelling in the day was no longer comfortable. On the 27th it rose to 102°. I consequently decided to pass the hot weather in the hilly tract to the west of the city known as Kohistan. I accordingly left the town on the night of the 29th, and reached Taft early the next morning, the Kalantar of the Parsis, their official head with the Persian government, accompanying me. My caravan consisted of one Hindustani Mohammedan (a Shiah), one Persian servant, a riding-horse, four mules, and two light tents of 60 and 40 lbs. respectively.

Taft is a town of about 1000 houses, and contains a mixed population, Mohammedans and Parsis, who live together in a friendly way. Its elevation is about 5400 feet, and the temperature was about 20°

lower than that of Yezd. As Taft has been visited by many previous travellers, I will not say more about it. From Taft I went on to the beautiful valley of Deh Bala in the midst of the hills. It is covered with villages and gardens, and shaded by trees, under which run streams of the clearest and the purest water. The elevation of the valley is about 8000 feet, and the temperature midday about 70°. Most of the well-to-do inhabitants of Yezd have gardens either here or in the adjacent villages, with summer houses to which they and their families resort during the hot season, precisely as we do in India to the hill stations. The cold in winter is excessive in these elevated regions, and the snowfall is so heavy that for days and days together the inhabitants are unable to leave their villages. The permanent portion of the inhabitants are fruit-growers and cultivators, and during the summer months may be met in large numbers bringing in their produce to the city at night on mules and donkeys in panniers. Amongst the products of Kohistan are mulberries, white and black, apples, cherries, melons, plums, figs, walnuts, filbert nuts, apricots, peaches, quince, and grapes, potatoes, cabbages, spinach, lettuce, cucumbers, beetroot, radishes, onions. Besides fruit-trees there are numerous other species, including the willow and poplar. On the hills themselves are a variety of shrubs, amongst which is the asafœtida plant, gathering the juice from which provides a lucrative employment to the inhabitants during the autumn months.

After a few days in the valley, I started to ascend Shir-Kuh, so called from its supposed resemblance in profile to a couchant lion. The ascent to a height of 11,400 feet occupied myself and the baggage the greater part of the first day, and comprised the steepest part of the ascent. We camped on an open slope sheltered by undulations, where there was water and an abundance of firewood in the shape of bushes about 3 feet high, which were easily uprooted. Next morning I rode up a gradual incline, passing a large snowdrift in a hollow facing north, and reached the summit, whose elevation I found to be 13,740 feet by boiling-point thermometers; the average of ten thermometers was taken. The temperature was 57° at midday, and though elsewhere the sky was cloudless, we experienced several slight showers from clouds hovering overhead. The view was magnificent. To the south-east and north-west stretched a great chain of peaks dividing Kohistan into two portions, that to the east being Pesh-Kuh, and to the west Pusht-Kuh, the intervening space, comprising the richest valleys and highest peaks, being known as Mian-Kuh. To the south a mountain whose last thousand feet or so were perpendicular walls of rock was the Kuh-i-Tezarjun, and further to the south-east lay the Kuh-Ardenushk; the heights of these two peaks, by angles taken by theodolite and plane-table, were about 14,000 and 14 500 feet respectively. To the north-east, upon a brown plain covered by haze, lay Yezd, with the domes and minarets of the Juma Masjid sparkling in

the sun; to the west lay other chains of hills. I was amused by my Hindustani servant Jafar, on my telling him to get tea ready, saying that there was no water, although there was a large snowdrift close by. The south side of the Shir-Kuh was almost perpendicular; one could have pitched a stone with ease from its summit into Deh-Bala lying 6000 feet below. The perpetual snow-limit in these parts would be a good deal higher than 14,000 feet, for the snow only lay where it was very much sheltered from the sun, and though it thawed during the day, it froze again at night. On the return journey we saw several large horned sheep, said to be *mouflon*, and saw a herd of ibex.

Returning to Deh-Bala, I visited the villages of Masha, of about 500 houses, with several other large ones close by. To do so we passed under the Kuh-Tezarjun, from which the ice-supply for Yezd is obtained. Masha is said to contain a large number of the Babi sect, but as they are still liable to persecution if reputed to be Babs, it is difficult to gain any reliable information on this subject. The next point of interest visited was Kal-Bal-Bisheze, a spot where a stream of water rushes out from under the mountains south-west of Mehriz, and waters the whole of the adjacent country. There is a pool about 200 yards in length full of fish, but they would not rise to a fly. At Darab I saw fish rise of 6 or 8 lbs., but could not hook one, though I got lots of half-pounders on a fine trout cast with two small black and a white moth flies. In some parts of Persia excellent fly-fishing is obtainable, and it is always advisable to carry a single-handed rod and fly-hook. There are a great number of quail and red-legged partridges in the Arderushk mountain, and also sand-grouse, rock-pigeons, and hares; also antelope near Mehriz. I have often seen from fifty to a hundred quail rise *en masse* from streams in the hills where they were drinking. There was a very tall and old tree in the village of Mehriz, which I measured by the common expedient of measuring the shadow of my walking-stick and then taking the length of the shadow of the tree. The inhabitants laughed at this, and, to prove my error, sent a boy up to the top of the tree, to let a string with a stone at the end of it down to the ground. The string was then stretched upon the turf and compared with the mark I had made showing the tree's height, and to their great astonishment they were found to correspond. After some reflection it dawned on some of the more thoughtful of them how it was effected, and they were immensely delighted with the idea. I know nothing of geology, but the hills near Yezd reminded me of the trap formations I have seen in India, and the circular formations of many of the hills, with a deep depression inside, suggested craters at some bygone period. There are some caves near Taft, partly natural and partly artificial, in which there are traces of copper ore, and antimony is occasionally found in fragments on the hills, but I believe that there are no mines working.

The weather being much cooler, I returned to Yezd in September,

and on the 25th of that month started for Jandak. After four marches in a northerly direction through mountainous country, I arrived at Tut, a village which I have described in a previous paper. Two more marches brought me to Zarin, a small hamlet at an elevation of about 3700 feet, and where I saw the first date palms since leaving Niriz, an indication that I was not far from the salt desert of Persia. The next 36 miles of the road were waterless; so, filling the water-bags, we started about four in the afternoon, and at ten at night bivouacked amid a waste of sandhills. Starting again at about 4.30 in the morning, we pushed on and reached the village of Hajiabad, a small oasis in the desert, and shaded by date palms. With the next forward march we reached the foot of the Kuh-Surukh, a reddish mountain overlooking Beyaza, and north of the Kuh-Parviz marked on existing maps. There was a spring here, which leaving at dawn we crossed the Gudar-i-Surukh (Red pass), 4860 feet above sea-level, and, descending, reached Beyaza, at an elevation of about 3300 feet. This place contains a shrine much resorted to by pilgrims. The governor of the district, who was on tour, came to visit me, and we became friends at once, and I promised to spend part of the winter with him at Khur, where the climate is unusually mild for these latitudes. Near Beyaza was the village of Ab-i-Garm, where a spring of water at a temperature of 125° issues from the ground, and within ten yards is another stream whose temperature is below 60°. It is much resorted to, as the waters are said to possess healing properties, and there is a small bathing-house over the hot stream. The natives say an Iman was killed here in a battle, and that where he fell the streams burst from the ground, which was previously dry, and have been flowing ever since. There is a good deal of lead ore in the hills between this and Beyaza, which is said to yield 30 per cent. of the pure metal, and also considerable quantities of alum. There are also ancient copper works close by.

The next place of interest I arrived at was Jandak, about four marches further on. Jandak contains about 1000 inhabitants, and is situated on a great slope which descends towards the salt desert. To the south of it is a great range of mountains with several lofty peaks, while to the north the salt desert stretches away like a sea before one, the mountains on the further side to the north being just visible. There is an old fort, with a massive wooden door which the inhabitants asserted was made from the wreck of a ship which floated on the prehistoric Dariya-i-Saveh that is asserted by tradition to have covered the salt desert. I saw several caravans of camels resting for the day previous to making the journey across the salt desert to Damaghan, which is waterless for nearly 100 miles. I made the latitude of Jandak 34° 3′ 41·5″, and the elevation about 3400 feet. From Jandak I decided to make straight across country by the nearest practicable route to Kashan, to ascertain the southern limit of the salt desert.

Leaving Jandak, I marched for three days in a southerly direction, making a *détour* round the immense sandhills which fringe the southern portion of the desert in many places. Distant on our right lay the Rig-i-Jin Sands of the Genii, which reach far into the desert, extending, it is said, right to the other side. Natives are very much afraid of them, and will not sleep there on any account, as they are said to be haunted. The inhabitants of Jandak asserted that formerly these sandhills were inhabited by wild camels, which were of a whitish colour and very swift; also that they used to go out and shoot them, but that about seven or eight years ago there was an unusual dearth of grass, which is supposed to have killed them, as none have been seen since. These animals are said to have been the product of stray beasts which wandered there originally. The sandhills are now said to have been broken through by the floods of salt water which are poured into the desert from the rivers and streams during the winter months.

On the third day after leaving Jandak I entered the Rig-i-Chichagun, an immense waste of soft sandhills, in some places nearly 300 feet in height, and reached a well in a hollow, where we camped for the night. We were now nearly on the level of the salt desert, the elevation being 2800 feet. For the greater part of the next two days we marched through the sandhills, which were covered with a dense growth of tamarisk bushes, averaging about 8 feet in height, though they sometimes rose to 14 feet, the sand being a little firmer immediately where they grew. We travelled through the bushes for about 9 miles, and as we progressed the whistling sound from thousands of jerboas, which scampered away into their holes on our approach, was incessant. They burrow under the roots of the tamarisk. The animals, or jerboas—for such I took them to be—were of a silvery-grey, with a chestnut tuft at the end of their long tails. Their fore legs were much shorter than their hinder ones, and as they sat erect—a favourite posture with them—had a strong resemblance to a miniature kangaroo. I shot one, so as to examine it more closely; but my servants, who concluded that anything shot was going to be eaten, remonstrated strongly, saying it was quite unfit for food. The tracks of hyenas were dotted over the ground in every direction. As I went on ahead of the caravan with the guide, we lit occasional fires to show the direction.

Leaving the tamarisk, which stretched away on our right, we arrived at a spring at the foot of a chain of hills called Nukluk. Close by were the ruins of a town built of stone, containing three or four hundred houses and a stone fort—remarkable features for this part of Persia, where all buildings are invariably constructed of sun-dried bricks. A mile further on were the remains of another town and fort built of stone. There were also the ruins of large embankments built across ravines in the hills, showing how the inhabitants obtained water. The fort was about 80 yards square and very massive,

and of a curious construction, as the towers had a peculiar bulge outwards in the middle of them. The walls were from 3 to 5 feet thick. The only ornamentation was that of the niches in the walls, consisting of four or five parallel lines surrounding them. A small building or dome on four arches stood near the entrance to the fort, and there was another one halfway up a hill close by. There were about 1000 houses in this further town. In many places lay heaps of stones from which the copper had been extracted by smelting. We had also passed numerous similar heaps in the tamarisk, and my guide said that he had heard that the town had formerly been occupied by Zoroastrians, who brought their ore here to smelt on account of the large supply of firewood. The ground inclined slightly upwards towards the hills, and I noticed that the lines of the fort were all parallel to it.

Twenty-five miles further on we reached Baba-Khalet, where there was an old tower built for protection against the Turkomans, who used to raid thus far. Its elevation was 3200 feet. It was now near the end of October, and in the evening some wild duck, the first I had seen on this excursion, came from the north and settled on the water. There were a lot of camel-drivers in the place, who recognized me, and said, "Ah! you're the *Feringhi* we had a row with at Anarak two or three years ago," and laughed, and told my servants the history of the affair. Finding fresh provisions running short, I sent my servants to a village I saw in the distance with my large telescope to get some more supplies, and halted for the day. This hamlet is the last one to the north until one gets close to Samnan. About 4 or 5 miles off in a northerly direction the country is covered with tamarisk for miles, and from a distance looks like a forest; these bushes grow very densely in many places along the borders of the swampy part of the salt desert, which is known as the Kavir or Dasht-i-Kavir.

The next seven marches were in a westerly direction, parallel to the mountains, which I occasionally passed through. There was no road, and only at rare intervals any track at all, and we were usually in sight of the desert on our right. On the fifth day we saw desert on both sides of us, and saw where the road from Yezd to Kashan ran along the foot of a great hill-chain containing the Kuh Natenz. We continued on over undulating grassy slopes, passing shepherds with countless flocks of sheep and goats belonging to the Sarab Arabs, who graze their flocks in these parts, and are said to be great robbers; but they were very friendly, for I told them I knew their chief, who was formerly Governor of Yezd, under the title of Seham-i-Sultan. In fact, I employed two of them, who I found invaluable as guides. On the eighth day from Baba-Khalet we reached a small village, and the next march, down a long and gentle descent for more than 20 miles, brought us on to the high-road, along which we travelled into Kashan.

Early in December I was joined at Isfahan by an old friend, Captain E. B. Burton, of the 17th Bengal Cavalry, who had previously arranged to meet me, and we started together for the Khur district. We went along the high-road as far as Nain, and then struck across a waterless desert to Anarak. The first day we did about half the distance, and halted for the night in a small stone building about 30 feet by 15. As it was intensely cold we all crowded into this, three Europeans—for Monsieur Staal had joined us at Nain—all our servants, four horses, the cooks and muleteers; there was hardly standing-room. However, we lit a large fire on a platform in the middle of the apartment, and settled down for the night. We started next morning at two, and reached Anarak before it got dark. Arrived there, we put up in the Caravanserai. The next day there was about a foot of snow on the ground, so we halted. As I have already described this town in a former paper, which was kindly read for me by Sir F. Goldsmid, it is unnecessary to say anything further about it.*

After halting for one day we left Monsieur Staal, who was prospecting for minerals, and resumed the march. After two days we reached Musajari, where there were some old stone ruins said to have been built by the Zoroastrians, who had a settlement in these parts, and also some *haoz*, or tanks for storing water, but mostly in ruins. The next place of interest reached after passing Abbasabad was Haft-Toman, whose elevation was 3500 feet, and the thermometer stood at 16° at night, the coldest reading we got in Persia. There was heavy snow all over the ground, which was not frozen, and as we neared the village we suddenly floundered into the cultivation, where our horses sank deeply. The villagers said they had no room anywhere for us, so my groom, dismounting, ran up to the headman, seized him by the collar, and, raising his whip, looked at us and said, "Shall I flog him?" We finally managed to get shelter in some empty huts without this event coming off, a few hundred yards from the village, and soon had a good fire burning, but sat on the floor to avoid the smoke, for which there was no outlet except the door. A couple of wolves were seen prowling round during the night, but we were both too tired to wait for a shot at them. So, after putting all the horses and baggage animals inside a building, we turned in for the night. In the morning we resumed our route to Garmab, descending gently all the way. At about half the distance we crossed the snow-line, and finally reached the town, which stood on an open slope surrounded by large plantations of date trees.

The warmth of this place was remarkable, the temperature ranging from 32° at midnight to 42° at noon. It was sheltered under a range of hills, and the water which issued from a cave blasted in the rock

* See R.G.S. *Supplementary Papers*, vol. iii., and *Proc. R.G.S.*, vol. 12 (1890), p. 577

was quite warm. There were about 500 inhabitants in the town, who came out to meet us, and a sheep was killed in the roadway as we entered. The headman said that all this was an *istikbal*, or reception in our honour. Garmab was only 700 feet below Haft-Toman, yet frost was very rare there, the inhabitants saying that it only occurred sometimes on cloudless nights, and that if there is a frost for more than nine or ten nights the date trees get blighted, and the crop, their chief means of sustenance, fails.

Our next march was on to Khur, and we had to cross a range of hills *en route*. On the hills a snowstorm overtook us, which obliterated the tracks rapidly, so we rode on at a fast trot. All of a sudden, while descending, we emerged out of the snowstorm and crossed a sharply defined line, beyond which there was no snow, and saw the town of Khur in front of us. After waiting in the town surrounded by a crowd, the governor arrived, returning from Farukhi, and we met with a friendly reception; a house was given us to live in, and stabling was provided. I had met the governor, Mirza-Mahdi-Honar, at Beyaza several months previously, and he and his uncle Mirza-Ibrahim, known as the "Yaghma," or robber, were both most polished and courtly gentlemen. It appeared that the latter was known by this name on account of his having been the victim of some injustice which ended in his being robbed.

While here we were told one evening by the governor, as he came in to take tea with us, that he had just had a row on our account. One of the *Moolahs* had denounced him for showing hospitality to *Kafirs* (infidels), and had collected a crowd with sticks and stones who marched towards the governor's house, intending to drive him out of the town as they had done his predecessor. Luckily, the Naib's brother was a captain of infantry, and he at once collected fifty or sixty of his men together and marched against the rioters, who, on seeing his force approaching, turned and fled. This was the first we heard of the proceedings. We stayed at Khur for two weeks, during which there was a good deal of rain, the temperature ranging between 44° at night and 58° at noon. There are some large date-tree plantations in the place, and all the crops are grown beneath their shade, as is also, I understand, the custom in the Sahara desert. The soil was everywhere impregnated with salt, and the water was slightly saline. The place stands at an elevation of 2600 feet, and is built on a *khur* or inlet which joins the salt desert, whose level is nearly the same in these parts. From here we made an excursion due north over a range of hills and down to within a few miles of the *kavir*. North, east, and west was one bare brown expanse as level as the ocean. If dry it would probably have shown up white, on account of the surface salt drying; here and there on its surface could be seen channels and streams of water twisting about, but not an atom of vegetation. The mountains

near Samnan, Turut, and Tabbas were plainly visible, while to our right a solitary rock stood out from the otherwise uniform level, known as Chashma Airacoon. Captain Burton, who was more to the east than I was, thought that the drainage of the *kavir* in this part—that is, to the east of a line drawn due north through Khur—runs south, and our observations for altitudes seem to bear this out.

Returning to Khur, we left that town on January 9, 1891, armed with letters of introduction from the Governor of Khur to all villages *en route*, and also to the Khan of Tabbas. On the first day we reached Chastab, and followed a route nearly the same as that travelled by the late Sir Charles Macgregor up to Tabbas. On the fourth day we crossed a neck of the salt desert, but could not ascertain how far it extended south, as sandhills in that direction shut out the view, but there were no signs of any large volume of water finding its way in that direction. At night we camped on a sandhill in the middle of it. The elevation of the salt desert here was 2130 feet, the lowest reading we got upon it. In the morning we found that all the mules had stampeded in the night, and Captain Burton's horse was lame. We had drunk up most of our water, so the only thing to do was to load up two camels, which were carrying water, forage, *and* firewood, with a tent and some supplies, and make our way on to Chah-Mehji as best we could. We made 18 miles this day, Burton on foot and myself riding. The ground was swampy in places and very uneven, resembling a muddy road full of deep ruts and footprints suddenly stiffened.

We marched on, reaching soft sand, and after it was dark the guide lost the track, so we lay down for the night where we were, with a waterproof sheet over our blankets. We woke in the morning to find it snowing hard, so loading up we hastily resumed the march. In an hour's time we came across the track, and, following it up, reached Chah-Mehji. There were one or two wells, and a couple of shepherds with large flocks of sheep and goats. Here we waited for four days, hoping our baggage would come on, our camel-man being sent back with water for our servants and horses the same afternoon. On January 15 and 16 it rained and hailed heavily, and we collected the hail from our tent and waterproof sheets to get fresh water, as the wells were brackish. The tent was very warm, as we had had 18 inches of felt sewn all round its lower edge; this was turned in, and a carpet and boxes placed over it, while a small iron pan filled with red-hot embers from a fire outside kept up the temperature. The tent, a double fly, with iron pegs and felt included, weighed only 50 lbs. On the third day our servants and the baggage came in. They had been found by a passing caravan, who dropped their own loads there and brought ours on; for this, of course, we paid regular salvage rates.

Next morning we loaded up, and they took us to Dorin, the nearest village, and on the direct route. In the evening our mules arrived; the

charvadar said that he had found them at Khur, nearly 80 miles further back. They were much cut about, the saddles having got under their stomachs. This hamlet was up in the snow at an elevation of 3000 feet. There were a few dwarf palms, and an oily film on the spring which bubbled occasionally. Immediately beyond the village was a great range of hills running north and south, and forming the eastern boundary of the salt desert. Resuming the march, which lay over these hills by a pass 700 feet above the village, we descended, and, passing through two hamlets, arrived at Char-Deh, which contained a fine large caravanserai recently built. The elevation was only 2000 feet. An immense salt plain extends southward from here in the direction of Tabbas, and to the south as far as one can see. This is said to be impassable in many places, and from its whiteness in parts is no doubt similar to the salt desert north of Khur and Jandak. If connected with them at all, which is open to doubt, it can only be by the neck of *kavir* which we crossed just before reaching Chah-Mehji, which is only from 15 to 18 miles broad at the utmost. Also the indications as to the flow of the water were so vague when we crossed, that both Captain Burton and myself concluded that at our crossing-point the drainage, if anything, was north. If so, the Tabbas desert is a separate one altogether, and considerably lower than the Dasht-i-Kavir: and as Char-Deh was well above it, and at least 2 miles off, its elevation cannot have been more than 1800 feet, and opposite Tabbas, whose elevation was 2100 feet and several miles from it upon a slope, considerably lower. The desert we now saw is probably part of the one which lies to the east of Yezd, behind a lofty chain of hills, and on which salt lakes or swamps are said to exist.

We sent on a servant to Tabbas with a letter of introduction from the Zil-i-Sultan, a royal prince and Governor of Isfahan. We were met outside the town by the Khan's nazir, and further on by mounted servants, who were useful in keeping off the inhabitants, who crowded round us as we passed through the city. A house was assigned us to live in, and servants were appointed to look after our wants; everything in the way of hospitality was done lavishly, in a truly Oriental style. The Khan sent us food every day, and insisted on feeding not only ourselves and servants, but also our hired muleteers and mules, while the nazir was always about inquiring what we wanted. Although it was the 21st of January, the orange trees in our garden were covered with fruit, and during our stay there of three weeks the thermometer never fell below 30° at night, or rose above 52° in the day. Once or twice a little snow fell, and we got some fair duck-shooting in the neighbourhood of the city. The Governor of Tabbas is the Imadah-ul-Mulk, and the post has been hereditary in his family for the last three hundred years. He is about seventy years of age, and suffers greatly from rheumatism; he was a most affable and courtly old gentleman. We often visited him, and I made him an enlarged portrait in water-colours, taken from a

photograph, with which he seemed greatly pleased. His house, or rather palace, was a fine one, with splendid gardens attached. The city numbers about 7000 inhabitants, and contains mosques, baths, and a college. Opium and tobacco are largely grown, and the number of trees, of sweet and bitter oranges, besides date palms, was considerable. One evening we sent the nazir a bottle of brandy to drink, and next morning asked him what he thought of it. He replied, "It is not very strong. I and a friend finished the bottle between us, and felt much the same as when we started drinking it, so we had to finish up with *arrack*"—a native spirit made from dates, and very heady.

Taking leave of our friends, amongst whom were one of the khan's sons, a Persian colonel, his vizier, and the nazir, we left the place, marching north. At Char-Deh we separated, Captain Burton going on to Dasgirdun, while I went round by a more circuitous route along the edge of the Dasht-i-Kavir. To do this I retraced my route for 17 miles, and then went north over some high ground through a pass into the *kavir* basin. *En route* we passed over a plateau about 4000 feet high, and saw many dying sheep and hundreds of their carcases, on which vultures were feeding. This was the result of a heavy snowfall, which came on so suddenly that they were unable to reach shelter, and so heavily that they could not get at the grass.

Leaving the hills, we descended to Halwun, at an elevation of 2600 feet, and near the *kavir*. The village contains about a hundred houses, and the sandhills which lie to the west of it are constantly encroaching and can only be kept out by high walls. The sandhills, which are low, extend for about 3½ miles in breadth, and terminate in *kavir*. To the south they extend beyond Chah Mehji for many miles. This place is said to be the site of the ancient city of Halwun, and the sandhills and hard clayey ground between them are strewed with broken pottery, tiles, and bricks for several miles, while in places the lines of the walls, towers, and houses are visible. It is said to have been a Zoroastrian city, and to have been overwhelmed by the sand, there is also a tradition that it was once a seaport. Numerous lines of ancient *kanats* could still be traced from the hills. The fragments of pottery I gathered and showed to an expert in such matters at Teheran were said to be *Cuphic*, and a gold coin reported to have been picked up there was examined by my Persian groom, a highly educated man, who said it had an inscription in the same language.

It seems to me unlikely that anybody would found a city amid a heap of sandhills. If so, it appears to indicate that the sandhills are comparatively recent accumulations of dry blown sand from the surface of the desert. The whole of the northern border of this desert is absolutely free from sandhills; so is the western one except near Chah-Shur and the Kuh-Tulha, while on the west and south-western and partly on the south border are immense accumulations. The eastern

slopes of the sandhills are, where they rest against no support, steep, while their western slopes are much gentler. My opinion is, therefore, that these hills have been formed by the west and north-western, which are the prevailing winds, and that their shape has been modified by the sheets and streams of water which come down from the hills after heavy rain, and give them the appearance of sandbanks which have been thrown up by rivers that have long since disappeared. In windy weather one sees the tops of the sandhills smoking, as it were, a dense cloud of sand being thrown off. The hills at Chah-Mesh-mus too are all said to be shifting west, and the bushes growing there all indicate a prevailing wind in that direction. The sand of all these hills is the same, a fine grey sand containing occasional small garnets. Innumerable beetles, the scarabeus, and lizards, scorpions, etc., live amongst them, while the tamarisk and in some places tufts of bunch grass grow. Besides these sandhills, I have seen others at Kashan and between Isfahan and Abadeh which contained extensive ruins.

The next march was to a village, Pir-Hajat, which is situated at a height of 3650 feet, at the foot of the Halwun range and overlooking the great desert. It is a fort containing but few inhabitants, and is perched on the summit of a rock, and resembles a mediæval castle. It is very ancient, and was formerly a Zoroastrian town named Irawar, which, after being conquered by the Arab Shaikh Pir-Hajat, took his name. It is situated on the banks of a broad watercourse, along which a torrent 40 feet broad poured violently down a great slope towards the *kavir*, on whose vast expanse a small white sheet marked its termination many miles away.

Leaving this village we soon entered the hills, and while crossing over one of them saw a vast sheet of water glistening in the sun, and about where the Kal-Mura river might be expected to terminate. I watched it for a long time through my glasses, and came to the conclusion it was water, as its banks were so distinct, and it had the true liquid colour and sparkle; but it may have been only a mirage, as will be seen later on. During this march I came across a lot of wild sheep; had a stalk and a shot, but did not bag one. We halted for the night at a hovel called Mazra-Dahna-i-Mimbar, round which there were lots of partridges, hares, and ibex. The next march, a long one over open ground, brought me to Dasgirdun, where I found Captain Burton, who had arrived before me.

This place was a collection of villages in the Tabbas district, and situated in a regular quagmire at a height of 2850 feet, on what looked uncommonly like *kavir*. If one went but a few feet from the beaten tracks, a horse would sink nearly up to his girths. The inevitable desert was well in sight; in fact, it was difficult to say whether we were actually in it or not. At this point we hired ten camels to carry our provisions, water, forage, and fuel, as we should get no further

supplies until we reached Turut, which would take eight or ten days provided all went well, and no swollen rivers or other obstacles were encountered. A servant of the Khan of Tabas, who had accompanied us thus far to facilitate our progress, now left with a gift of a Waterbury watch, at which he was greatly pleased.

On the second day, and at a distance of 18 miles from our starting-point, we crossed a ravine about 200 yards broad, with small cliffs for banks; this I learnt was the Kal-Lada river, which flows into the *kavir*, but was now dry. It rises about the foot of the Kuh-Yak-Ab, a lofty peak some miles to the east, under which I had halted in 1888. Then on to the foot of the Kuh-Safeid (white hill), where we halted for the night. The next march, over several miles of slopes covered with swarms of sand-grouse, brought us to the Kal-Dasgun river, which I once mistook for the Kal-Lada, by which latter name it is erroneously called in a former paper read on my journey in 1888. A little further on we reached ground I had previously travelled over near Chashma-Dubor, from which point the whole of the journey to Turut was over ground already described.

The only difference was in the time of year. On my previous journey, which took place in August, the heat was intense, and locusts, horse-flies, large tarantulas, and snakes abounded; whereas now it was the month of February, and the only things to trouble us were leeches, which abounded in many of the springs. The day before we crossed the Kal-Mura river, I had a large telescope upon a hilltop, and in the evening saw on the salt desert what appeared to be a large lake many miles square, and could see the waves caused by the wind. Captain Burton also saw it. Next morning there was not a vestige of it visible, and I can only suppose that it was a mirage. We both saw the same kind of sights frequently; for instance, when descending from Chastab we distinctly saw a sheet of water on the desert, and the Halwun hills lying beyond reflected in it. But next day, on viewing the same spot from other points, there was not a sign of any water on the desert at all. It is therefore possible that what I saw from the hills near Pir-Hajat, and took to be water, was nothing but mirage. The atmospheric effects in these regions are peculiar; distant hills often appear as points in the air, while the sky runs along underneath them, and as one approaches nearer the sky under them fades away, and the bases of the hills join the ground. Midday waves of heat are given off by the soil to such an extent that objects look double their size, and distorted out of all proportion. When overtaking our camels, which always started about six hours before us, we often amused ourselves by speculations as to what the curious objects looming ahead were, whether they were men or camels, or men mounted on camels.

(To be continued.)

THE ORIGIN OF THE KAFIR OF THE HINDU KUSH.

By Colonel T. H. HOLDICH, R.E., C.B., C.I.E.

SPECULATIONS as to the origin of the Kafir have been free and frequent of late years. It has long been known that the Kafirs themselves claim a Greek origin, or at least that some, amongst the many tribes represented by the name of Kafir, claim this distinction. The most natural as well as the most recent hypothesis is, that they are the modern representatives of a very mixed race, chiefly of Tajak origin, who once occupied the lowlands of Badukshan, and that they have gradually been driven into the almost impenetrable fastnesses of the lofty mountains which they now occupy by successive generations of land-grabbers, who at present hedge them in under the names of Safi, Nimcha, Dehgan, etc. These people may have originally been Kafirs themselves, although, through contact with the outer world, they have lost the prominent physical attributes of the Kafir; but they now range themselves amongst the most fanatical of Mahomedan sects, and between them and the Kafirs of those hidden valleys which lie south of the Hindu Kush watershed, between the Panjshir and the Kunar rivers, there is nothing short of eternal blood-feud. Quite lately the Afghan has appeared on the Kafir borderland, and the process of proselytizing at the point of the bayonet has been commenced, which can but end in the extinction of the infidel forms of faith. There are villages to be seen in the Kunar basin where yet you may find the quaint dead-boxes of the Kafir—the wooden receptacles into which their dead are laid without the form of burial—side by side with the Mahomedan grave, with its neat and orderly mound of earth decorated with stones, and with a wooden effigy at head and foot. The religious observances of the Kafir are so mixed, and show such an impartial leaning to Zoroastrianism, Brahmanism, and pure heathen superstition, that it might appear that they are either the possessors of an original form of religion, from which has been evolved the first principles of other modern forms, or that their own form is but an imperfect adaptation of Gabr and Brahmanic beliefs to an ancient mythology.

Apparently they have no written language the characters of which might give us a clue to their origin, and not much is to be gained from the study of a language colloquially whose dialects vary so much between tribe and tribe, that tribal inter-communication is frequently impossible. It must be remembered, however, that Kafirstan is but very partially explored. Only the fringe of the country has been visited as yet, and we cannot presume to say what may be found in the interior. The people whom we know best are Kamdesh Kafirs from the lower Bashgol valley. The Bashgol is a large affluent of the Kunar river, joining it from the north-west some 40 miles below Chitral; the Bashgol valley in its upper reaches being separated from Chitral by the barrier of the

Hasund range, which reaches an altitude of 15,000 to 16,000 feet above sea-level opposite Chitral.

In the case of the Kamdesh Kafir, at least, the tradition of Greek or Pelasgic origin seems likely to be verified in a very remarkable way. Scientific inquiry has been converging on him from several directions, and it seems possible that the ethnographical riddle connected with his existence will be solved ere long. In appearance he is of a distinct Aryan type, with low forehead and prominent aquiline features entirely free from Tartar or Mongolian traits; his eyes, though generally dark, are frequently of a light grey colour; his complexion is fair enough to pass for southern European; his figure is always slight, but indicating marvellous activity and strength; and the modelling of his limbs would furnish study for a sculptor. In rapidity of movement over a hill country he stands unrivalled even amongst Himalayan people. His manners, customs, and dress have all been recently well described by Dr. (now Sir George) Robertson, whose adventurous spirit led him to spend some months amongst the Kafirs of lower Bashgol.

At the present moment Kafirstan extends no further eastward than the valley of the Kunar river, but there appears to have been a time in remote history when the Kafirs occupied the fertile valleys of Bajour, Swát, and Dir—valleys which for subsequent centuries formed part of a great Budhist kingdom prior to the advent of the Yusafzais upon the scene. Readers of Arrian's history of the invasion of India by Alexander will remember that much of the interest of that graphic narrative centres itself on this border of India. Though comparatively unknown and even unexplored in these days, it must be remembered that to ancient classical writers this was perhaps the best known of all the outlying districts of India. The recognized road to India from Central Asia was that which passed through the plains of Kabul, by the valley of the Kabul river into Laghmán, or Lamghán, and thence by the open Dasht-i-Gumbaz into the lower Kunar. From the Kunar valley this road, even to the time of Baber's invasion of India (early in the sixteenth century), crossed the comparatively low intervening range into Bajaor; thence to the valleys of the Panjkora and Swat, and out into India by the same passes with which we have now (after nearly four hundred years) found it convenient to enter the same districts. As it was the first great avenue of approach to India, so its geography became more especially familiar by repute, and there is, consequently, more accurate geographical reference to the valleys of the Kophenes and the Khoaspes (*i.e.* the Kabul and the Kunar) in classical authors than to any other part of the hydrography of India.

On the right bank of the Panjkora river (the ancient Ghoura), nearly opposite to its junction with the river of Swat (Suastos), is a very conspicuous mountain whose three-headed outline can be distinctly seen from the Peshawar cantonment, known as the Koh-i-Mor, or

mountain of Mor. On the southern slopes of this mountain, near the foot of it, is a large scattered village called Nuzar, or Nusar. The sides of the mountain spurs are clothed with the same forest and jungle that is common to the mountains of Kafirstan, and to the hills intervening between Kafirstan and the Koh-i-Mor. Amidst this jungle is to be found the wild vine and ivy.

Now let us turn to Arrian's history. After fierce fighting in the Kunar valley with a people who "far excelled all other Indians in military exploits," Alexander passed through the territories of the Guræi, and crossed the river of that name (now called Panjkora) with great difficulty, "not only because of the depth and rapidity of the stream, but by reason of the vast number of round and slippery stones at the bottom," and led his army against the city of Massaga, the capital of the Assakeni. This city was in the upper Swat valley, and it made a brilliant but unavailing defence. Then followed the march to Embolina, on the Indus (now known as Umb), and the episode of Aornos, one of the most stirring tales in history. After the reduction of that natural fortress (now identified beyond dispute with Mahaban), we are told that, "descending from the rock, he marched into the territories of the Assakeni" *again*, "for he had heard that the brother of Assakenus . . . had fled into the mountains there, and when he arrived at the city of Dyrta (Dir), found both that and all the country round entirely destitute of inhabitants." Thus it is clear that he retraced his steps for many marches towards the Kunar valley, hunting the brother of Assacenus. Apparently he never caught him, that chieftain having probably betaken himself to the Chitrali hills, where the roads, as we know, are bad, and where there is not much room for fighting. Alexander then turned "towards the Indus," and "entered that part of the country which lies between the two rivers, Kophenes (Kabul) and Indus, where Nysa is said to be situate." "The city," says Arrian, "was built by Dionysos, or Bacchus, when he conquered the Indians; but who this Bacchus was, or at what time or from whence he conquered the Indians, is hard to determine. Whether he was that Theban who from Thebes, or he who from Tmolus, a mountain of Lydia, undertook that famous expedition into India, . . . is very uncertain." However, as soon as Alexander arrived there, a deputation of Nysæans, headed by one Akulphist, waited on him, and after recovering from the terror that his extraordinary appearance inspired, they presented a petition. "The Nysæans entreat thee, O king, for the reverence thou bearest to Dionysos their god, to leave their city untouched, . . . for Bacchus . . . built this city for an habitation for such of his soldiers as age or accidents had rendered unfit for military service. . . . He called this city Nysa (Νυσον) after the name of his nurse; . . . the mountain also, which is so near us, he would have denominated Meros (or the thigh), alluding to his birth from that of

Jupiter; . . . and as an undoubted token that this place was founded by Bacchus, the ivy, which is to be found nowhere else throughout all India, flourishes in our territories."

Why, in the face of such a plain description of the city of Nysa, so great an authority as M. de St. Martin should identify it with Nisata, which is in the open plain near the juncture of the Kabul and Swat rivers, I cannot say. There is no mountain near Nisata, and no ivy nearer than that grown in some of the pretty gardens at Peshawar. Alexander, for reasons of his own (and Arrian seldom fails to supply him with real mean ones), was pleased with the deputation, and granted the petition, and ordered that a hundred of the chief citizens should accompany him. It was then that Akulphis showed much native shrewdness in suggesting that, if he had the good of the city at heart, he should take two hundred of the worst citizens instead of one hundred of the best—a suggestion that appealed at once to the sympathies of an administrator like Alexander, and the demand was withdrawn. Alexander is then said to have visited the mountain and sacrificed to Bacchus, his Macedonian troops meanwhile making garlands of ivy, "wherewith they crowned their heads, singing, and calling loudly upon the god, not only by the name of Dionysos, but by all his other names." A truly Bacchic orgie seems to have followed; and all this undoubtedly took place at the foot of the Koh-i-Mor, which is within sight of Peshawar, and hard by where our troops have fought their way to Chitral.

But who were the Nysæans, and what became of them? M. de St. Martin says that the name Nysa is clearly of Persian or Median origin; and we find in the 'Indika' of Arrian some further description of the Nysæans. "The Assakenoi" (who inhabited the upper Swat valley east of Nysa), says Arrian, "are not men of great statue like the Indians, . . . not so brave, nor yet so swarthy as most Indians. They were in old times subject to the Assyrians; then, after a period of Median rule, submitted to the Persians. . . . The Nysaioi, however, *are not an Indian race*, but descendants of those who came to India with Dionysos," etc. He adds that the mountain "on the lower slopes of which Nysa is built" is designated Meros, and he clearly distinguishes between Nysaioi and Assakenoi.

Ptolemy barely mentions Nysa, but we learn a good deal about the supposed origin of the Nysæans from fragments of the 'Indika' of Megasthenes, which have been collected by Dr. Schwanbeck, and translated by McCrindle. We learn that Dionysos was a most beneficent conqueror. He taught the Indians how to make wine and to cultivate their fields; he introduced the first "sanatarium" by retreating to Meros in the hot weather, where "the army, recruited by the cool breezes and the waters which flowed fresh from the fountains, recovered from sickness. . . . Having achieved altogether many great and noble works, he was regarded as a deity, and obtained immortal honors," etc.

Again we read, in a fragment quoted by Strabo, that the reason of calling the mountain above Nysa by the name of Meron was that "ivy grows there, and also the vine, although its fruit does not come to perfection, as the clusters, on account of the heaviness of the rains, fall off the trees before ripening. They" (the Greeks) "further call the Oxydrakai descendants of Dionysos, because the vine grew in their country, and their processions were conducted with great pomp, and their kings, on going forth to war, and on other occasions, marched in Bacchic fashion with drums beating," etc.

Again, we find, in a fragment quoted by Polyænus, that Dionysos, "in his expedition against the Indians, in order that the cities might receive him willingly, disguised the arms with which he had equipped his troops, and made them wear soft raiment and fawn-skins. The spears were wrapped round with ivy, and the thyrsus had a sharp point. He gave the signal for battle by cymbals and drums instead of the trumpet; and, by regaling the enemy with wine, diverted their thoughts from war to dancing. These and all other Bacchic orgies were employed in the system of warfare by which he subjugated the Indians and the rest of Asia."

All these lively legends point to a very early subjugation of India by a Western race (who may have been of Greek origin) before the invasions of Assyrian, Mede, or Persian. It could not well have been later than the sixth century B.C., and might have been earlier by many centuries. The Nysæans, whose city Alexander spared, were the descendants of those conquerors, who, coming from the West, were probably deterred by the heat of the plains of India from carrying their conquests south of the Punjab. They settled on the cool and well-watered slopes of those mountains which crown the uplands of Swat and Bajaur, where they cultivated the vine for generations, and after the course of centuries, through which they preserved the tradition of their Western origin, they welcomed the Macedonian conqueror as a man of their own faith and nation. It seems possible that they may have extended their habitat as far eastward as the upper Swat valley and the mountain region of the Indus, and at one time may have occupied the site of the ancient capital of the Assakenoi, Massaga, which there is reason to suppose stood in about the position now occupied by the town of Manglaor; but they were clearly no longer there in the days of Alexander, and must be distinguished as a separate race altogether from the Assakenoi. As the centuries rolled on, this district of Swat, together with the valley of Dir, became a great head-quarters of Budhism. It is from this part of the trans-frontier that some of the most remarkable of those sculptures have been taken which exhibit so strong a Greek and Roman influence in their design. They are the undoubted relics of stupas, dagobas, and monasteries belonging to a period of a Budhist occupation of the country, which was established

after Alexander's time. Budhism did not become a state religion till the reign of Asoka, grandson of that Sandrakottos (Chandragupta) to whom Megasthenes was sent as ambassador; and it is improbable that any of these buildings existed in the time of the Greek invasion, or we should certainly have heard of them.

But along with these Budhist relics there have been lately unearthed certain strange inscriptions, which have been submitted by their discoverer, Major Deane, to a congress of orientalists, who can only pronounce them to be in an unknown tongue. They have been found in the Indus valley east of Swat, most of them being engraved on stone slabs, which have been built into towers, now in ruins. The towers are comparatively modern, but it by no means follows that these inscriptions are so. It is the common practice of Pathan builders to preserve any engraved or sculptured relic that they may find, by utilizing them as ornamental features in their buildings. It has probably been a custom from time immemorial. Only lately I observed evidences of this propensity in the graveyard at Chagan Sarai, in the Kunar valley, where many elaborately carved Budhist fragments were let into the sides of their roughly built "chabutras," or sepulchres, with the obvious purpose of gaining effect thereby. No one would say where those Budhist fragments came from. The Kunar valley appears at first sight to be absolutely free from Budhist remains, although it would naturally be selected as a most likely field for research. These undeciphered inscriptions may possibly be found to be vastly more ancient than the towers they adorned. It is, at any rate, a notable fact about them that some of them "recall a Greek alphabet of archaic type." So great an authority as M. Senart inclines to the opinion that their authors must be referred to the Skythic or Mongolian invaders of India; but he refers at the same time to a sculptured and inscribed monument in the Louvre, of unknown origin, the characters on which resemble those of the new script. "The subject of this sculpture seems to be a Bacchic procession." What if it really is a Bacchic procession, and the characters thereon inscribed prove to be an archaic form of Greek—the forgotten forms of the Nysæan alphabet?

Whilst surveying lately in the Kunar valley along the Kafiristan borderland, I made the acquaintance of two Kafirs of Kamdesh, who stayed some little time in the Afghan camp, in which my own tent was pitched, and who were objects of much interest to the members of the boundary commission there assembled. They submitted gracefully enough to much cross-examination, and amongst other things they sang a war-hymn to their god Gish, and executed a religious dance. Gish is not supreme in their mythology, but he is the god who receives by far the greatest amount of attention, for the Kafir of the lower Bashgol is ever on the raid, always on the watch for the chance of a Mahomedan life. It is, indeed, curious that whilst tolerant enough to allow of the

existence of Mahomedan communities in their midst, they yet rank the life of a Mussulman as the one great object of attainment, so that a Kafir's social position is dependent on the activity he displays in searching out the common enemy, and his very right to sing hymns of adoration to his war-god is strictly limited by the number of lives he has taken. The hymn which these Kafirs recited, or sang, was translated word by word, with the aid of a Chitrali interpreter, by a Munshi, who has the reputation of being a most careful interpreter, and the following is almost a literal transcript, for which I am indebted to Dr. MacNab, of the Q.O. Corps of Guides :—

"O thou who from Gir-Nysa's (lofty heights) was born
Who from its sevenfold portals didst emerge,
On Katan Chirak thou hast set thine eyes,
Towards (the depths of) Sum Bughul dost go.
In Sum Baral assembled you have been.
Sanji from the heights you see; Sanji you consult?
The council sits. O mad one, whither goest thou?
Say, Sanji, why dost thou go forth?"

The words within brackets are introduced, otherwise the translation is literal. Gir-Nysa means the mountain of Nysa, Gir being a common prefix denoting a peak or hill. Katan Chirak is explained to be an ancient town in the Minjan valley of Badakshan, now in ruins, but it was the first large place that the Kafirs captured, and is apparently held to be symbolical of victory. This reference connects the Kamdesh Kafirs with Badakshan, and shows these people to have been more widespread than they are at present. Sum Bughal is a deep ravine leading down to the plain of Sum Baral, where armies are assembled for war. Sanji appears to be the oracle consulted before war is undertaken. The chief interest of this verse (for I believe it is only one verse of many, but it was all that our friends were entitled to repeat) is the obvious reference in the first line to the mountain of Bacchus, the Meros from which he was born, on the slopes of which stood the ancient Nysa. It is, indeed, a Bacchic hymn (slightly incoherent, perhaps, as is natural), and only wants the accessories of vine-leaves and ivy to make it entirely classical.

The vines and ivy are not far distant. In making a slow progress through one of the deep "darras," or ravines, of the western Kunar basin, leading to the snow-bound ridges that overlook Bashgol, I was astonished at the free growth of the wild vine, and the thick masses of ivy which here and there clung to the buttresses of the rugged mountain spurs as ivy clings to less solid ruins in England. The Kafirs have long been celebrated for their wine-making. Early in the nineteenth century, when the adventurer Baber, on his way to found the most magnificent dynasty that India has ever seen at Delhi, first captured the ancient city of Bajaor, and then moved on to the valley of Jandoul, now made historic by another adventurer, Umra Khan, he was perpetually indulging in drinking-parties, and he used to ride in from Jandoul

to Bajaor to join his cronies in a real good Bacchic orgie more frequently than was good for him. He has a good deal to say about the Kafir wine in that inimitable diary of his, and his appreciation of it was not great. It was, however, much better than nothing, and he drank a good deal of it. Through the kindness of the Sipah Salar, the Amir's commander-in-chief, I have had the opportunity of tasting the best brand of this classical liquor, and I agree with Baber—it is not of a high class. It reminded me of badly corked Chablis, which it much resembled in appearance.

Time may perhaps have further and more perfect information to lay before us about these strange people, the Kafirs. At present I cannot but believe them to be the modern representatives of that very ancient Western race, the Nysæans—so ancient that the historians of Alexander refer to their origin as mythical.

I feel that I must acknowledge my obligations to Mr. McCrindle, from whose excellent translations I have quoted freely, and whose classical research has pointed the way to some most interesting fields of inquiry in remote parts of India. His books possess the invaluable attribute of portability.

LAKE LOUISE, IN THE CANADIAN ROCKY MOUNTAINS.

By WALTER D. WILCOX.

WHILE making a hasty overland journey by the Canadian Pacific Railway during the summer of 1891, my attention was called to the remarkable beauty and grandeur of the Canadian Rockies. Again in July, 1893, in company with a college friend, I spent several weeks at Banff and Lake Louise, the latter a beautiful sheet of water surrounded by the grandest mountains along the line of the Canadian Pacific, and now annually visited by possibly one hundred tourists. Remaining two weeks at Lake Louise, we had time to attempt the ascent of the two highest mountains in the vicinity, but failed in each instance, being stopped by a vertical rock wall of great height on one mountain, and on the other by the dangerous condition of the snow, where we narrowly escaped an avalanche. We were not properly equipped for accomplishing much in a region unexplored and unmapped, where we were necessarily our own guides, and where, by reason of the heavy forests in the valleys, it is very difficult to carry a tent or provisions to any great distance from head-quarters.

The failure of this season inspired me with a desire to organize, if possible, a party for the summer of 1894, which should be equipped to thoroughly explore and survey the region in the vicinity of Lake Louise, to ascend several of the highest peaks, and to make photographs of every interesting feature. It is not necessary to dwell on the difficulties attending the organization of a party of men to travel several thousand miles to a region about which they knew nothing save what they could

gather from a few photographs and tales of my former experiences. Suffice it to say that a party, consisting of Samuel Allen, of the Swiss Alpine Club, Yandell Henderson, Lewis F. Frissell, George Warrington, and the writer of this article, all of Yale University, was induced to go, and arrived on the field early in July.

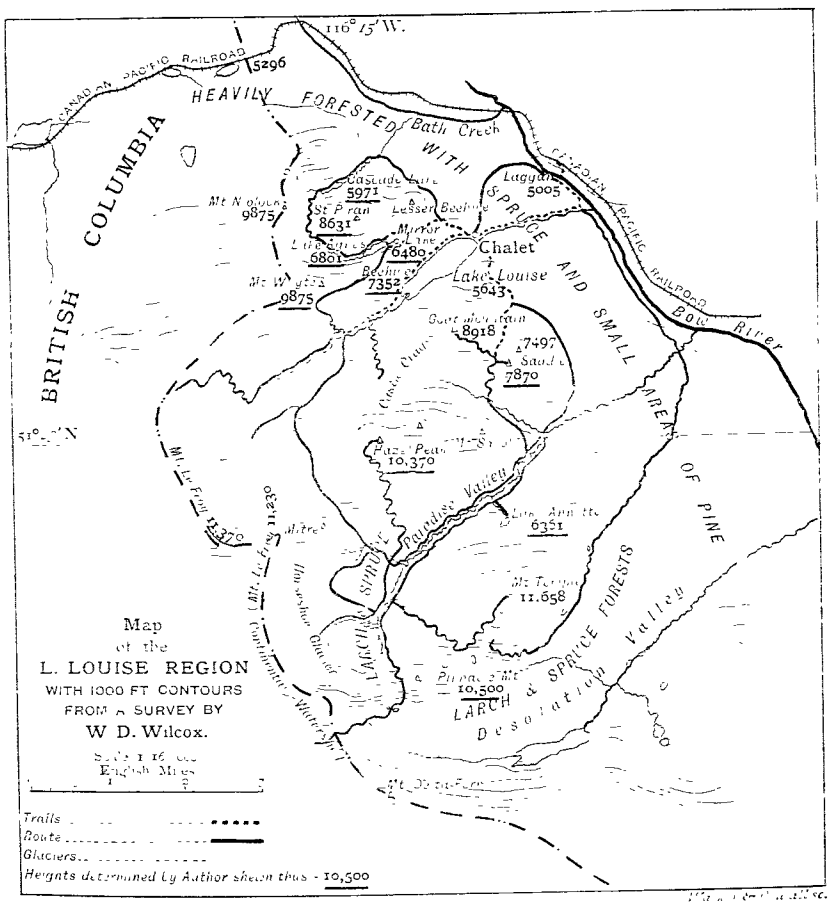
The outfit consisted of a plane table and telescopic alidade, kindly furnished by the United States Geological Survey, a prismatic compass, two steel tapes, a mercurial barometer, two watch-size aneroids, a thermometer, and compasses For our mountain work, we had several hundred feet of manilla rope and four ice-axes modelled after the most approved Alpine form. For photography, there were three cameras and twenty-five dozen dry plates of several degrees of rapidity.

It would be in place here to define more accurately the location of the field of operations. Roughly speaking, we may define it as a region in the extreme western part of the province of Alberta, and south of the Canadian Pacific road, in lat. 51° 25′ N. The extent of the area might be approximately indicated by saying that it would all be included in the half-circle formed by the line of the railroad and the arc drawn with a radius of 10 miles from the station called Laggan. That the area thus limited should have occupied us an entire summer will appear less remarkable after a discussion of the extent and character of the difficulties presented.

From the line of the railroad at and near Laggan, one sees to the south a long range of lofty peaks in great part covered with snow and ice, and forming the grandest scenery along the entire road, the Selkirks not excepted. This is the summit range of the Rockies, the watershed of the continent, for on the other side of these mountains the water flows into the Pacific, while here the rushing waters of the Bow river are hastening toward the Atlantic. Two miles south of Laggan there is a small lake hardly 1¼ mile in length, but so beautiful in itself and in the grand mountains which surround it, that a waggon road has been opened throughout the forests to the lake, and a Swiss chalet erected near the shore for the reception of tourists. This was first occupied in July, 1894, though as early as July, 1891, there was a log-house with several rooms for the entertainment of travellers. We made the present chalet our head-quarters for the greater part of the summer.

In order to understand the topography of the tract surveyed, in a general way, it may be described as follows: The Bow river valley, running about south-east and north-west near Laggan, has an average width of fully 4 miles. The main range of the Rockies runs nearly parallel to the valley, and lies about 6 miles to the south-west of it. The area surveyed includes five short spur ranges which branch off at right angles from this summit range, and hence cause the valleys between them to open into the Bow valley at right angles. The altitude of the Bow river at Laggan is 5060 feet. Mount Temple, the highest in the

region, is 11,658 feet above sea-level Mount Lefroy is the next, with an altitude of about 11,370 feet, and, in addition, there are nine or more peaks over 10,000 feet in height. The average elevation of the lateral valleys is about 5800 feet. Now, the absolute height of mountains is generally thought of the first importance, but those who have given any attention to the subject know that their relative height above the valleys is the criterion by which we judge their impressiveness and grandeur.



The gloomy depth of these Rocky mountain valleys, and the unusual steepness of the cliffs overlooking them, entirely redeem their inferior height, when compared with the Alps or other well-known mountainous regions. Without further discussion by way of introduction, this article will be perhaps better understood when the various subjects are treated under the heads of History, Geology, Botany, Meteorology, a short discussion of the Fauna, and of our methods of surveying. It might be appropriate to say that what applies to the small area explored.

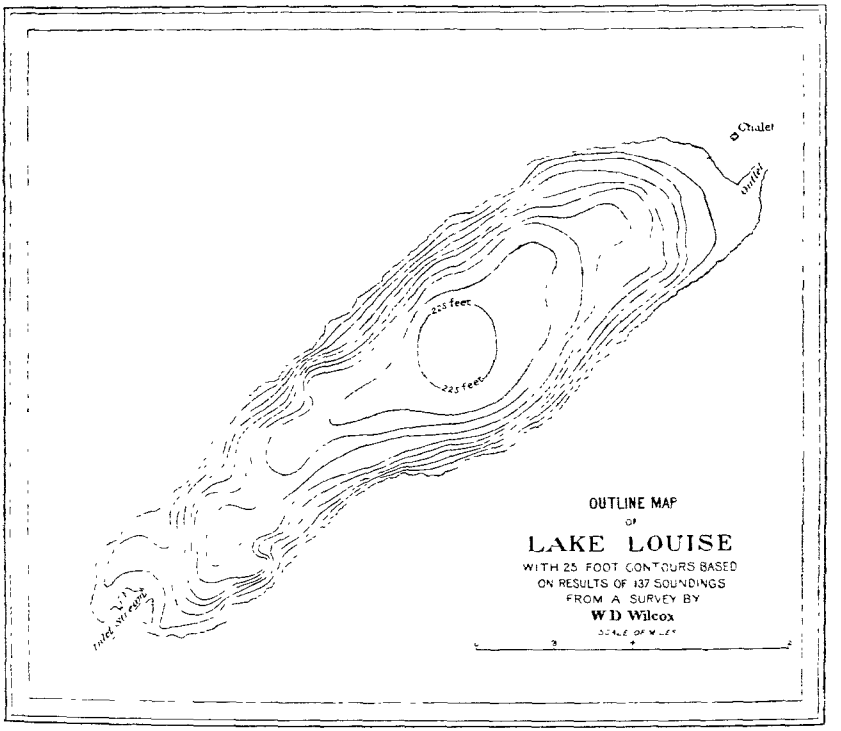
applies almost equally well to a much larger tract, and that little or nothing new could have been added if the area had been many times greater. The geological structure, of course, would vary much in every way even if a slightly more extensive area had been surveyed, except in regard to the Quaternary; the flora and fauna less so; while the climatal conditions would remain fairly constant, and only vary locally.

History.—Speaking generally of the Rocky mountains between the latitudes of 49° and 51° 30′ N., Dr. Dawson says in his "Preliminary Report" on that region, that previous to Palliser's expedition in 1857, no maps or knowledge of passes existed south of the Athabasca pass, though the region had been traversed as early as 1810 by Howse. The first published account of travels in the region was by Sir George Simpson. He crossed the Rockies in 1841, and his narrative of the trip appeared in 1847. His description of the country is not clear, nor can many of the places be identified from it. In 1858, Dr. Hector, entering the mountains by the Bow river valley, crossed the watershed by the Vermilion pass, and after following the Vermilion, Kootanie, and Beaverfoot rivers, returned over the watershed by the Kicking Horse pass, which he discovered, and which is the one now used by the railroad. Dr. Dawson, in 1874 and subsequently, retraced all of Dr. Hector's routes, and traversed many others besides. In 1881 the first railroad surveys were made in this region. In 1886 the first tourists were carried across the continent on the Canadian Pacific road. The first published account by a tourist, so far as the writer knows, and, in fact, the only accessible information on the region, except a few short and mostly inaccurate descriptions in guide-books, occurs in the last chapter of Dr. Green's book, 'Among the Selkirk Glaciers.' Here an account is given of his visit to Lake Louise, which therefore falls within the limits of the small region explored by our party in 1894.

Of any previous specific explorations in this region before our work began, or of any mountain ascents, except that of Mount Lefroy, climbed in 1890 by McConnell, we had no knowledge. Nor were we able to obtain any maps of this region, except Dr. Dawson's, the small scale of which rendered it useless for our work. It was, therefore, somewhat in the spirit of pioneers and first explorers that we visited the several valleys mapped. We were always our own guides, as no one could be found who knew anything definite about the passes or mountains. The Canadian Pacific road seems to have appreciated the attractiveness of the Louise region, and, with a view towards encouraging tourists to visit the place, have constructed a waggon road more than two miles in length, connecting Laggan with the lake. Three trails have already been made, leading from the chalet to points of interest in the vicinity.

Geology.—The formations represented are about 3500 feet of Lower Cambrian quartzites, overlaid in the higher peaks by a series of limestones attaining here a maximum section of 2500 feet. A single

trilobite, together with a few fragmentary specimens, was found at an altitude of 9500 feet while making an ascent of Hazel peak (10,370 feet, from aneroid reading). These fossils were found on a long scree slope, and though we spent some time searching for the original beds, we did not succeed. Fragmentary specimens of trilobites were also found at an altitude of 10,500 feet while ascending Mount Temple. The best specimen was identified by Mr. C. D. Walcott, Director of the United States Geological Survey, as *Zacanthoides spinosus*, thereby referring the limestone beds from which they came to the Middle Cambrian.



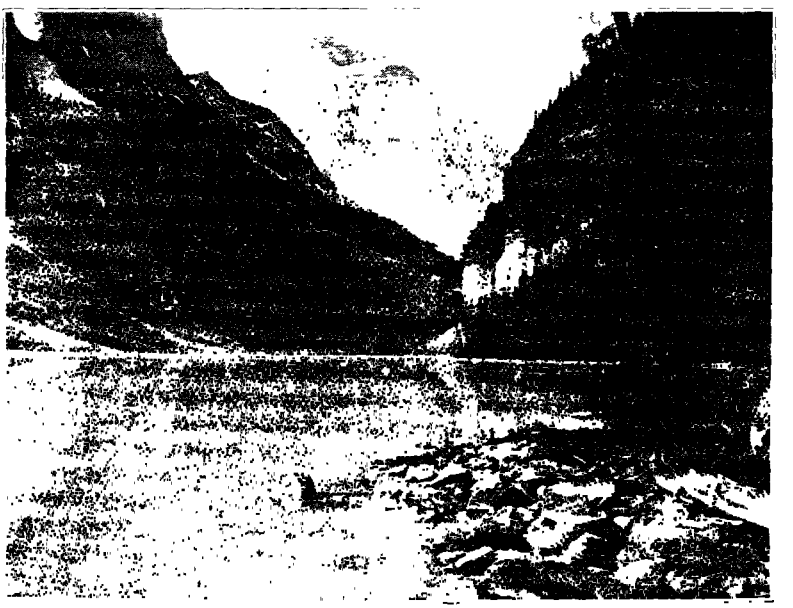
Folds and flexures are absolutely wanting in the whole region surveyed, except for a general but very gentle synclinal structure, having the summit range as the axis. The strata are therefore nearly or quite horizontal everywhere, except in the extreme ends of the spur ranges as they approach the Bow valley. Here there is a gentle and gradual upward tilting, indicative of an anticlinal structure in the Bow valley. The maximum dip here approaches 12°. The valleys are, therefore, formed entirely by erosion. A very interesting example of the results of aërial erosion is seen in the beautiful mountain named by us Pinnacle mountain. The wonderful slender pinnacles or columns seen on the slopes of this mountain are from 100 to 200 feet high, and

so small in diameter as to give them the proportions of a pencil set on end. There one can see these pinnacles in all stages of formation, narrow high ridges being the next to last. These have been worn down in such a manner as to make flutings and channels in the ridges, owing, possibly, to planes of fracture. A further accentuation of the channels finally pierces the ridge entirely, and it dissolves into a row of pinnacles, indicating where a ridge formerly existed. These pinnacles are further remarkable on account of their low altitude (8000 feet), showing that extensive glaciation has not existed since they were formed or nearly formed.

Quaternary.—There are no deposits of any age between the Middle Cambrian and the quaternary. The action during this age has, however, had much to do in determining the features and topography of the region. The cliffs at the base of the valleys always exhibit the action of ice to a greater degree, while those near the summits, unless near existing glaciers, show a preponderant aërial action. There is no clearly defined line of demarcation between them, and the evidence of one form of action or the other vary locally to a considerable degree. An average altitude of about 9000 feet seems to be the upper limit of any previous general glacial action. We may therefore imagine the maximum glaciation of the Quaternary to have, for the greater part, submerged these valleys and mountains with a field of ice, above which the higher mountains appeared as islands. We may also presume that the flow of the ice had, in the short valleys and in the longer Bow valley, the same general direction as the existing surface drainage. Standing on the summit of Goat mountain and looking across the Louise valley to the west, this faint line of highest glaciation can be discerned on the mountains, with a downward slope corresponding somewhat to the slope of the valley bottom. This might be deceptive but for the fact that the slight upward tilting of the strata as they run northward is cut across by the slight downward slope of the former glacial level The altitude of the ice-level at the head of the valley was approximately 9000 feet, and probably 8000 feet at the "gap," or entrance.

Glacial Striæ.—These were observed in surprisingly few places, though constant attention was paid to their discovery. In Paradise valley, the bed rock one mile north of the present glacier is well scored and striated in and near a stream channel. This instance was, however, below the level of present glaciation. The only other striations observed in the quartzite were in the Louise valley, on the very summit of a small mountain called the Beehive, 7352 feet in altitude. Long, coarse, but shallow striations are formed here, some of which were quite faint, and only distinguished from the rest of the surface rock by lines of dark lichens growing in them. The direction of these striæ was parallel to the general direction of the valley, and shows that the ice which made these scorings was not merely local, but part of a great current setting

out of the valley. Here we have direct proof that the ice formerly existed up to a level of at least 1709 feet above Lake Louise, and 1934 feet above its bottom. Near the base of the Beehive, at Lake Agnes, a single stratum of soft red shale about 7 feet thick appears, and may be traced for some distance north and south. Though the beds of quartzite above and below show merely a rounded, polished contour, destitute of striæ, this softer stratum is most exquisitely carved with striations of all sizes down to the merest hair-lines. Apparently the quartzite was too hard to receive scratches from pebbles and boulders of its own structure. The rounding of the cliffs, however, and of all projecting knobs of rock, is almost universal in these valleys, especially on



LAKE LOUISE FROM NEAR THE END ON WEST SHORE, LOOKING SOUTH-WEST; INFERIOR PEAKS OF MOUNT LEFROY IN THE DISTANCE.

the "stoss" side, which was here usually the south-west exposure. One very fine example of glacial elasticity was discovered in the red shale referred to above. A small projecting buttress on the side of a vertical cliff had been worn down into a conical form with a flat top, some 3 feet high, and nearly 2 feet in diameter at base. This frustum was beautifully fluted and striated with vertical *spreading* lines which opened more and more toward the base. This was done by a branch glacier which occupied the Lake Agnes trough, and presumably remained some time after the period of maximum glaciation. This glacier was undoubtedly very similar in size and steepness to the glacier which now exists on Hazel peak.

Morainal Material.—Drift covers the whole Bow valley up to the base of the mountains. At the Bow river the bluffs rise 125 feet above it, and consist of typical boulder clay throughout. The river itself rests on this material, and shows no bed rock at this point. The new waggon road follows the outlet stream from Lake Louise, and gives some good sections. The stream itself has cut down as much as 100 feet in many places through the boulder clay. Many fresh pebbles and boulders were turned out in the construction of the road, which are about equally of limestone and quartzite; most all the boulders show rounding and striations on one or more sides. The largest piece was a great slab 25 feet long by 8 feet wide, and from 3 to 4 feet thick. The whole surface of the Bow valley up to Lake Louise is plainly a series of moraines. The present chalet is built on one, which makes the dam to the lake, and all the way to the Bow river there is a succession of nearly parallel ridges, presumably left by a fan-shaped extension of the Louise glacier as it retreated, and after the general glaciation of the Bow valley had disappeared. It appears that there was a long pause at the gap, during which time the glacier piled up two or three hundred feet of morainal material, and formed a dam to its own waters after it retreated. A glance at the contour map of the lake shows, from its great depth, how much material must have been transported in order to so completely choke the end of the valley. A tendency to submarine moraines is suggested by the contours at the head of the lake. The terminal moraine of the existing glacier lies about one mile south of the lake, and some 600 feet above it. The piles of moraine are about 700 feet in width, and average fully 150 feet in depth—an immense mass of material, but not at all surprising after a glance at the glacier itself, which for a mile from its snout is so thoroughly covered with *débris* as to completely conceal the ice. Some of the boulders on the glacier were calculated to weigh from 35 to 40 tons. Immediately beyond the present moraines, which have a very recent and fresh appearance, the landscape is often forest-clad, and the boulders have an aged appearance, entirely different from the oldest boulders of the moraine. When we take these points in connection with the fact that nothing that might be styled a moraine exists between the lake and the present terminal moraine, we may conclude that the retreat of the glacier from the lake-bed to its present position was too rapid and uniform to leave any traces of terminal moraines. The fact is evident, from a study of many glaciers in the Rocky mountains, that the existing glaciers are now nearly as large as they have ever been since their final retreat in the great Ice age. This is contrary to the almost universal retreat of the glaciers in Switzerland, Norway, and Alaska. Nevertheless, Dawson notes that there are universal indications of increased humidity and rainfall in this part of the Rockies, such as abnormal height of lakelets without outlets, which has killed a belt of trees on their borders—evidence of recent floods

greater than any previous ones for fifty or one hundred years, and other signs of greater rainfall. If these conditions have existed for even a few years, the glaciers would be sensibly increased.

Present Glaciation.—A reference to the map shows that the present glacier is quite extensive. The longest glacier occupies the end of the Louise valley, and is over $3\frac{1}{2}$ miles long. The structure of the rock strata is such as to cause the formation of great fields of snow near the summits of many of the mountains, which become glaciated and flow downwards for 1000 or 2000 feet at steep angles, often 45°, and then break off in great masses as the ice is slowly pushed over the precipice. This condition of things is the cause of frequent magnificent avalanches, for the hanging glaciers often exist at the top of a nearly perpendicular



LOOKING TOWARDS MOUNT LEFROY, 11,370 FEET, FROM THE SUMMIT OF COAT MOUNTAIN, 8918 FEET, FOUR MILES DISTANT.

rock wall from 1000 to 2000 feet high. The ice thus breaking off is a source of fresh supply to the glaciers below. In July and August the thunder of these avalanches is very frequent, especially before sunrise. Water freezing in the crevasses must be the immediate cause of this. The thickness of the ice in the hanging glaciers is from 200 to 250 feet. They show about twenty dark lines running horizontally in the cross-section. These are 12 or 15 feet apart near the top, but compressed to a foot or less at the bottom. They undoubtedly register the annual snowfall, the dark bands being the dirt which is brought down by slides during July and August, while the white part represents the uninterrupted accumulation during the rest of the year.

A brief *résumé* of the results of the Quaternary would call attention to a certain relation between present glaciers and existing lakes. Lake Louise is the result of a long pause of the retreating glaciers while the dam was piled up. The flat bottom of this lake, together with its very steep sides, gives the U-shaped cross-section characteristic of glacial valleys. The same relation exists between the glaciers and lake in Desolation valley, also the small glacier on the west side of Mount Temple. No lake exists in Paradise valley corresponding to Lake Louise, but a glacial dam is very apparent, and above it a long tract of level swampy land. For some reason the dam was not high enough to give the lake great depth, and this, combined with a stream charged with much more sediment than in the Louise valley, has conspired to fill up the basin and obliterate the lake which undoubtedly existed here. In this way Lake Louise is being rapidly filled, as may be seen by the well-formed delta. Moreover, for one-fourth of a mile above the head of the lake the land is quite level, and only rises 2 or 3 feet above the lake, indicating the original area of the water-surface. In July and August the muddy stream from the glacier rushes swiftly along, carrying sediment and pebbles, up to an inch in diameter, into the lake, depositing the heavier particles on the delta, and sending a line of discoloured water far out into the lake, the deep blue-green waters of which become quite milky toward the end of summer. The lacustrine deposits are of unknown depth, but consist of a dark blue, somewhat arenaceous clay, which covers the bottom everywhere.

Flora and Fauna.—These were not studied at all, though it was our intention to make a collection of plants if there was time enough. A distressing accident during a mountain ascent delayed the surveying work so much that this line of study had to be given up. However, some of the more important and interesting plants and animals that came before our attention will be mentioned

Flora.—The almost universal forest tree from the Bow river up to the tree-line is Englemann's spruce. This tree forms a rich and luxuriant dark forest wherever the slopes are not too steep to support a thin soil. They average 75 feet in height and about 15 inches in diameter. This tree is occasionally replaced in part by small areas of the black pine. The Lyall's larch can only contest on equal terms with the spruce at about 6800 feet above sea-level, and from there up to the tree-line, which is here about 7400 feet. It might be mentioned, in connection with the tree-line, that the snow-line, as determined by the limit of névé on the glaciers of this region, lies somewhat lower, approximately 7000 feet. One or two snow patches remained near the shores of Lake Louise (5643 feet) till August 1.

There are only a very few deciduous trees, which appear chiefly along the banks of rivers or in open sphagnum swamps caused by slight morainal dams, and also in the clearings made on the mountain slopes

by snow avalanches in winter. A few bushes, and especially the numerous herbaceous plants, make a most beautiful and brilliant floral display during July and August. Epilobiums and Castilleias line the barren, gravelly flood courses of glacial streams, and make a bright but discordant array of magenta and scarlet flowers. A species of Myosotis grows very abundantly in the valleys. *Aquilegia Canadensis*, which is scarlet in the eastern states, here grows yellow throughout. The forests are filled with multitudes of elegant flowering plants, of which none



ENTRANCE TO PARADISE VALLEY, LOOKING SOUTH OR WEST. THE FOREGROUND REPRESENTS THE FILLED UP GLACIAL LAKE, CORRESPONDING IN POSITION TO LAKE LOUISE.

is more widespread or more attractive than the one-flowered Pyrola (*Moneses grandiflora*). As in all Alpine regions, the plants seem more brilliant in coloration as the snow-line is approached. Many dwarfed forms of plants, chiefly Compositæ, grow on peaks and slopes over 8700 feet above tide, while a species of anemone, though growing lower, often seems to push its eager stalk through the edges of retreating snow, and blossom within a few yards of snow that is almost perpetual. No adequate idea, however, of the number and variety of flowering plants in these mountains could be conveyed without the aid of a systematic

list, which unfortunately is not at hand. It might be stated that the vegetable life is a feature of the greatest beauty, no available spot, from valley bottoms almost to the limits of vegetation, is left unoccupied.

Fauna.—A great number of interesting animals were either seen or their tracks observed—the black bear, mountain lion, lynx, wolverine, porcupine, weasel and marten, several species of rodents, squirrels, rabbits, marmots, and a number of small rat-like animals inhabiting the rocks in Alpine regions. By far the most characteristic animal in the region is the Rocky mountain goat. This animal corresponds in habits and shyness to the chamois of Switzerland. The coat is nearly snow-white, long, shaggy, and very thick. Both sexes are furnished with horns about 7 to 10 inches long, curving gently backwards, and very sharp. One goat was shot by a member of our party, after six weeks' constant hunting, which weighed about two hundred pounds. They are said to attain a weight of three hundred pounds in some specimens. In all, twenty-eight goats were seen by us, several singly, the rest in herds of five, six, and eleven respectively. They are a magnificent animal, inhabiting the loftiest mountain slopes, and running with ease and indifference along precipitous ledges and places impossible to man. Endowed with wonderful faculties of scent, sight, and hearing, and being, beside, very timid by nature, they are a most difficult animal to hunt, and will naturally preserve themselves for many years, as few hunters have the patience or fortitude to get near enough for a shot.

Lake Louise and its outlet is quite full of small trout, which do not ever attain to more than 10 inches in length, but are very excellent for the table.

The forests are full of a great variety of birds, many of which sing the greater part of the summer. In the deeper woods are found a species of pheasant called the blue grouse, and along with these, and also more frequently in the "alps" and rocky slopes of lesser mountains, a species of grouse called by some ptarmigan, and by others the fool hen. Both these birds are good eating, and, when fired at, will usually remain quite unmoved until killed. Hence the name of the species.

Great flocks of black ducks, mallards, and divers visited the lake during August and September, as many as fifty being seen at once from the chalet.

The entomology of the region has been almost exhaustively studied by Mr. Bean, a telegraph operator at Laggan. He has a large and exceedingly valuable collection of beetles and butterflies. Some of the species found at great heights are identical with those discovered in the Arctic regions, and never found outside of those places before or since, except on these mountain summits.

The insect life has a most important and serious bearing on the traveller in the shape of mosquitoes and horse-flies. The mosquitoes are well-nigh innumerable, and constitute the only drawback to this

otherwise ideal mountain region. They entirely disappear every year after August 12 or 15.

Meteorology.—One of the most important considerations in a mountain region is the character of the weather during the summer season. Whymper has written, in his book on the great Andes of South America, sufficiently about the persistently rainy character of the weather there to deter almost any one from visiting those mountains with the intention of mountaineering. During July and August the weather in the Canadian Rockies is unusually steady, with a great preponderance of clear sunny days. Rain rarely falls during the six weeks from July 1 to August 15, except occasional showers at night. A period of rainy weather lasting three days occurred during the first week of August, which was, however, exceptional.



MOUNT TEMPLE, 11,658 FEET, FROM THE "SADDLE," LOOKING SOUTH

Over two hundred observations of the mercurial barometer and thermometer were made from July 25 to October 9 inclusive. Daily observations were made, and, whenever possible, as many as three, at the hours of 8 a.m., 2 p.m., and 8 p.m. The maximum temperature observed was 78° on August 19; the minimum on September 22 and October 6 being 21°. The hottest week fell between August 17 and 23 inclusive, when the morning and evening readings averaged 57° and 58° respectively, and the 2-o'clock readings 74°. From these data it may be seen that the tourist and mountaineer have no hot valleys

from which to start their exploration or ascents, as is the case in Switzerland. A cool, dry atmosphere, most remarkably lucid, and a deep-blue sky, coloured to the most distant horizon, are the normal conditions. The south-west is the quarter from which the prevailing wind blows, though this is a difficult point to ascertain in a narrow, deep valley where the mountains must influence the lower air-currents to a great degree. The month of June is one of the worst of the year, rainy, changeable weather being the rule. Snow may be expected by September 15 in all but the lowest valleys. Consequently, the summer season is very short. A brief consideration of the astronomical conditions will solve this at once. The latitude of this region (50° 25′) is so high, that during summer the sun is above the horizon three-fourths of the day. Twilight continues throughout the night as late as July 6, the time of our arrival. Hence the shortening of the days towards the equinox is very rapid, and winter sets in very suddenly. The moon is rarely seen, and never at the full until the latter part of August. Hence we may conclude, inasmuch as the sun occupies the same part of the ecliptic in winter as the full moon in summer, that there are several months near the winter solstice during which the sun practically *never* rises in those narrow mountain valleys. The cold of midwinter is intense, but probably no more so than in the plains to the east, where the thermometer at times falls to 65° or 70° below zero Fahr. Snow was almost constantly on the ground at the level of Lake Louise after September 15, but this was said to be unusually early. During the summer months snow may fall above the level of 9000 feet at any time, and frosts often occur in the valleys.

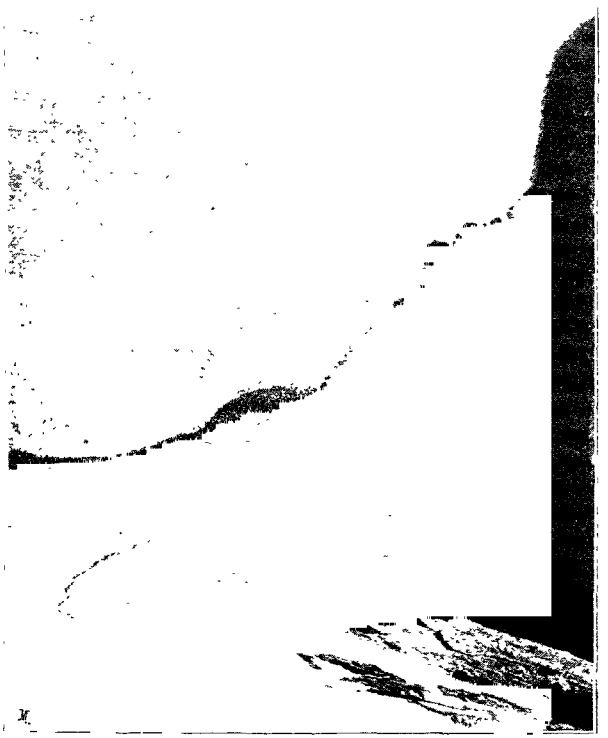
It is difficult to judge of the total precipitation, as no reliable data are at hand. The snow is said to be 6 or 8 feet, or even 10 feet, on a level in the valleys during the winter. Owing to the tendency for the maximum precipitation to take place on and near the highest mountain, this fall would be much increased over the névé regions. From sections of hardened snow, which, having a glacial flow, were crowded over a precipice and so caused to break off, the average depth between the dark bands referred to above as showing the annual snowfall seemed to be about 18 feet.

In regard to dangerous and sudden storms, only two instances were observed of sudden formation of clouds below the mountain summits, and in both these cases the barometer gave ample warning.

A few remarks might be made under this topic in regard to forest fires. These originate, in great part, from the railroad, but also from careless hunters and prospectors, who are, indeed, accused of wilfully firing the forests to open up the country, and more rarely from Indian hunters. A certain cause, but probably rare, is lightning. An authentic instance was reported last summer of a gentleman who saw a lightning flash, and, shortly after, fire in the forest where it struck.

Hundreds of miles of forests have been already consumed, and the danger is always present and apparently increasing. The smoke from these fires, though often 50 or 100 miles distant, obscures the atmosphere more or less almost one-third of the time during July and August.

Methods of Surveying.—The surveying was done by means of plane-table and alidade, the latter furnished with a powerful telescope. A base-line of 600 feet was first measured with a 50-foot steel tape on the shore of Lake Louise. This was the longest possible straight level place



MOUNT TEMPLE, WITH LESS FOREGROUND, TO SHOW THE DEPTH OF VALLEY.

to be found. A series of small cairns built of flat stones was constructed to a height of 18 inches above the water-surface, having been first roughly aligned by the alidade. These were 50 feet apart. Smooth, flat stones capped each of these, and by means of the alidade sighting on a plumb-line, marks were made on these in alignment. A steel tape was used to measure from one cairn to another. This was repeated a number of times, and then movable signal flags were placed at either end of the base-line. The lake was then mapped very carefully by

means of a great number of signal flags. This work required over three weeks. The lake was afterwards sounded, mapped, and contoured from 137 soundings.

After the lake was mapped, a one-inch scale map was started, and two of the lesser mountains located. The plane-table and alidade were then carried to the summits of each of these mountains, not, however, without considerable labour. The principal features of the area were located from these points, and the streams, etc., sketched in from over 120 photographs taken in all parts of the region. Subsequently, another base-line of 3900 feet was measured on the railroad track, in order to get angles on some of the peaks visible from there. Comparisons between the results from the two base-lines show considerable accuracy. Goat mountain and St. Piran differed on the two maps by about 118 feet on a total distance of almost two miles. Some errors must creep in on account of the bluntness of mountain summits and their varied aspect from different positions. Independent angles with a plotted distance gave 8876 and 8880 feet for the height of a signal flag on St. Piran, a result far within the limits of probable error by this method. The height of Mount Temple resulted in 11,611 and 11,691 feet from the two ends of the base-line. These average 11,651 feet, which is within 7 feet of the calculated height. It was not known until this result had been worked out that the mountain measured was Temple, and, in fact, this close result first excited the suspicion that led later to a knowledge of its previous measurement.

Conclusion.—The characteristic features of the region by which these mountains and the Canadian Rockies in general are differentiated from other mountain regions, as the Alps, Andes, and Himalayas, are found not so much in the geological age and nature of the strata as in the extent and character of those erosive forces which have resulted in forming narrow, deep valleys, often with precipitous rock walls of great height and grandeur, thus making the mountains relatively very high. Added to this, climatic conditions sufficiently moderate in summer to tolerate, and humid enough to encourage, a rich vegetation, there results a fortunate combination of beauty and grandeur which has already begun to attract the admiring attention of travellers. The by no means excessive precipitation of snow is offset by a long period of nearly ten months for accumulation, resulting in extensive glaciation on the higher peaks. As these points are favoured by the addition of a clear, cool, and invigorating atmosphere, there is but little doubt that the Canadian Rockies will enjoy an ever-increasing popularity and favour among travellers and mountaineers.

ACCOUNT OF A VISIT TO NIUAFOU, SOUTH PACIFIC.

By Lieut. BOYLE T. SOMERVILLE, of H.M.S. "Penguin."

[THE small island of Niuafóu, which lies by itself in the Pacific, about midway between the Fiji and Samoa groups, is a part of the dominions of Tonga, though separated from those islands by more than 200 miles. It is seldom visited save by small traders, and, though it has been known to present a remarkable instance of that class of volcanic island which has blown off the shell covering the vent and excavated interior, and left a mere ring—in this case perfect—round a central cavity, no very complete description of it has before been received. The account (dated "H.M.S. *Penguin*, August 17, 1895") of a recent visit by the officers of H.M. surveying vessel *Penguin* will therefore probably be interesting.—W. J. L. Wharton.]

1. GENERAL DESCRIPTION OF THE ISLAND.

Niuafóu island is the northern limit of the Tongan dominions, and lies in lat. 15° 34′ S., long. 175° 41′ W. It is almost circular in shape, being by an estimation given in the Sailing Directions, about $3\frac{1}{2}$ miles by 3 miles in diameter, and rises to an average height of 350 feet above the sea, with six or seven moderately marked elevations, the highest of which is 588 feet. It is thickly covered with vegetation throughout, with the exception of one place on the south-west of the island, where a lava stream, recently formed, has not yet received its coating of green.

The inhabitants, about 1000 in number, live in nine villages, all on the seaboard. They are Tongans, with a few emigrants from Uea, or Wallis island, and are all Christians, either of the Tongan State religion, Wesleyan, or Roman Catholic denominations.

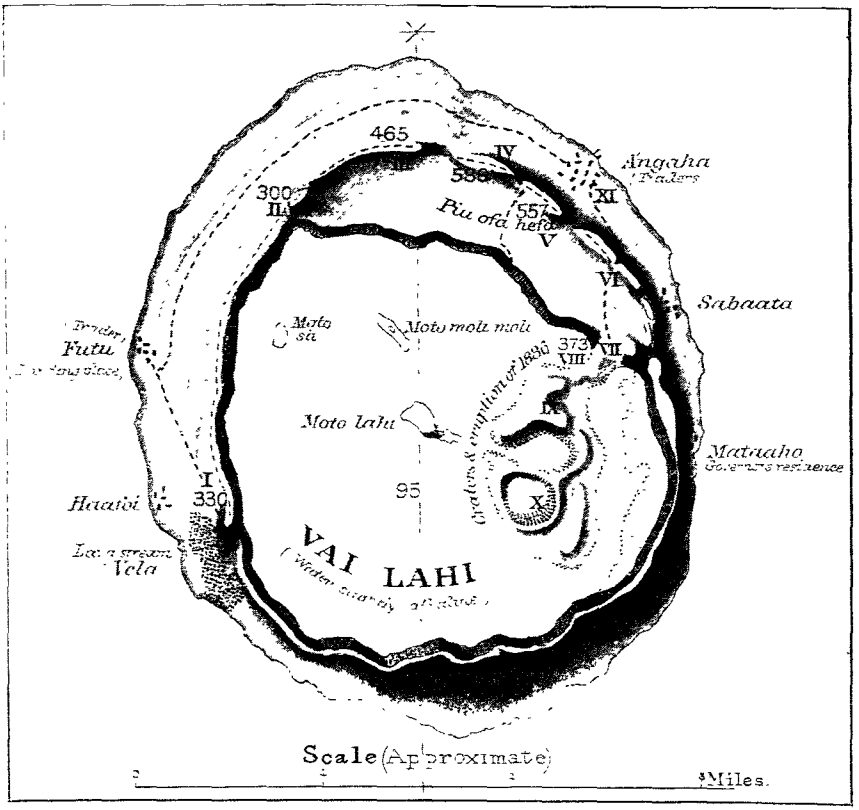
The island is under a native Tongan governor, who is apparently often at Hapai; but there is a native magistrate always resident, who deals with minor offences. The majesty of the Tongan law is supported by a small corps of police, who also superintend the forced labour of convicted criminals on the roads, and other works.

There is one French missionary priest resident in charge of a very small flock, who, with two English traders and one German, form the white population. Mr. Tarris, the principal white trader of the island, has lived here for over twenty years, but at the time of our visit was away at Tongatábu on matters of business.

The principal village, Añgaha, is on the northern side, just below the highest part of the island, and is conspicuous from seaward by the white houses of the traders, two native churches, and their native pastors' dwellings, etc. The next largest village, Sabaata, is a little distance round to the eastward, and further still in the same direction is Mataaho, where the governor's house is situated, almost facing full to the south-east trade wind. On the south-west is a village called

Haafoi, just below the lava stream before mentioned; and further round again, on the north-west, is Futu, the best landing-place in the south-east trade season, where the third trader has his establishment.

The whole coast-line is bounded by the most forbidding black lava rocks, on which the white surf continuously breaks. Opposite Futu, however, and at Aúgaha also, the lava has conveniently poured itself out seaward in the form of short rough jetties; and landing may more



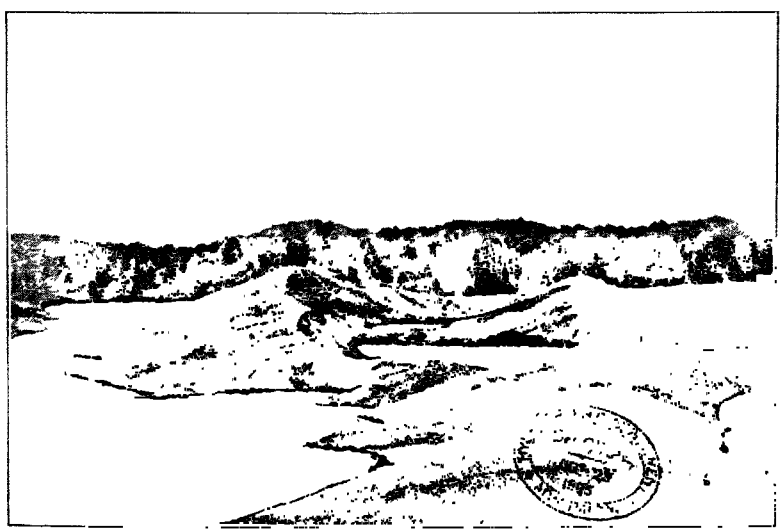
PLAN OF NIUAFÓU (FROM EYE-SKETCH).

or less easily be made on these, when the tide is suitable and the wind favourable. Probably there are more places of similar form facing the other villages, for a Norwegian barque recently spent a month at the island, during which time she loaded over 500 tons of copra, anchoring in front of each village in turn for that purpose.

The anchorage is, however, said to be very inferior all the way round, the bottom being foul ground; and there are over a dozen anchors and various lengths of cable known to have been left behind on the bottom by vessels calling here for trading purposes.

2. Account of a Day's Expedition through the Island.

We landed on the natural rock jetty opposite Futu on the morning of August 17, 1895, a party of six officers, and were met by a number of natives, standing among whom was a white trader, Mr. James Yarndon. The French missionary, hearing that a man-of-war of some description was off the island, and expecting daily a brother priest by the next one of his own nation that arrived, had hurried round at daybreak the 4½ miles from Angaha, where his house is. We saw him inspecting us from a little distance as we landed, and no doubt he was exceedingly disappointed at viewing the inevitable knickerbockers and unmistakable boots of the English tourist. We met him a few minutes



VIEW OF CRATERS AND ERUPTION OF 1886, FROM ABOVE ANGAHA.

afterwards, but he was all welcoming smiles and bows of greeting by that time.

We knew that there was a lake in the centre of the island, and that traces of recent volcanic activity were to be seen at one spot; so, placing ourselves under the guidance of Mr. Yarndon, who kindly undertook that office, we started off along a very fair road to view these natural curiosities, luncheon-bag and camera following with a native on a horse, of which we were surprised to find a great many on the island, the luxuriant grass everywhere affording capital feed.

Our path, wide enough almost for two carts to pass, led under the pleasant shade of the trees, and struck off first to the southward, with a general rise. After a little over a mile, it brought us into an open space, with a steep pinch of hill on the inner side, and a large area of black

lava, the stream before mentioned as visible from the sea; on the other, dotted with little islands and oases of green.

Some portions of this place are still heated, and the whole district is called "Vela," signifying "hot." It is unwise to walk over it unless accompanied by a native, as there are various quicksands and other dangerous spots scattered throughout its extent. We did not adventure on to it, intending to go there if possible before returning to the ship in the evening (which, however, we were unable to do); so, turning to the left, we spurted up the short steep path which confronted us on that side, which led upwards amid taro and banana gardens.

Suddenly we were on the top, and, on going round, were filled with surprise and pleasure at the unexpectedly beautiful scene which lay in front of us. The island, which now lay mapped before our eyes, is nothing more than a ring of land, probably nowhere as much even as a mile in width; and the whole of the interior area, of about 3 square miles, is occupied by a most picturesque, almost circular lake, roughly 2 miles in diameter, containing three green islands. Round its entire



VIEW FROM 330 FEET SUMMIT ABOVE HAAFOI VILLAGE.

circumference from the ridge on which we were now standing, dropped down a sheer precipice, 200 and 300 feet in depth, over which the exuberant foliage and huge creepers of the tropics cast their display of leaf and blossom. From amidst this profusion of greenery, great bare shoulders and buttresses of rock thrust out, which, forgotten ages ago, must have looked down on the hideous molten mass of mud and rock, heaving and seething in the huge crater basin of fire below, now covered by the peaceful lake.

The spot where we were standing was 330 feet in height by the aneroid, and this is about the average even height of the great crater lip; but there are several summits on the ridge, mostly on the northern and eastern sides, and it is also varied by a rather marked dip which occurs abreast of the lava stream near this first position.

The lake appeared to be almost circular; the regularity was broken in one place only by the upheaved ground of the eruption of 1886, the bare reddish surfaces of which we could just see 2 miles away to the eastward. A photograph was taken from this spot, but as the trade wind was blowing with unusual force, driving swift showers and clouds across the sky, the unsteadiness of the camera prevented the plate from doing justice to the scene.

We arrived on this part of the ridge at 8.30, and, after a short halt, proceeded along the crest by a very fair path to the northward, gradually circling round to the scene of the last eruption.

Specimens of rock and surface sand were collected at various positions; but, owing to the depth of the rich soil even here on this narrow edge, it was only rarely that geological specimens presented themselves on the surface. The soil of the island-ring is evidently of the richest, most prolific nature, and this has been taken every advantage of by the natives. Garden after garden of banana, taro, and other tropical food-plants met our view in all directions; and what at a distance appeared to be bush, on closer inspection became a very forest of coconut palms, of which there must be some millions on the island. It surpassed all of our previous experiences of tropical cultivation or extent of coconut groves.

The northern arc of the island is wider across than elsewhere, and though it rises up steeply enough from the seaboard, there is, after the first precipitous dip on the inner side, a nearly flat area—not inhabited, but largely cultivated—which then dives down to the lake-edge by a native path, only just possible to be scaled.

The path above then leads to the highest part of the ridge, where there are two summits near one another, of which the aneroid gave 588 and 557 feet as elevations respectively. The second of these is crested by a flat grassy mound, the grave of some chief's wife of an earlier day; and here we had a pleasant spell, it being now 11.30, though the heat of the sun was considerably tempered by an unusually strong and squally trade wind.

This summit is called Piu Ofa Hefa, and from it we could see, almost perpendicularly below us, Aŋgaha, the principal village of the island, with its clean huts and houses dotted on the grass, bordered by the foam-edged rocks of the seaboard; beyond them again the white horses of the south-east trade swell; and there, rolling along before the wind, the *Penguin*, steaming slowly round the island, and stopping every now and again to sound. Inside, the lake lay spread before us with its three islands, Moto Lahi, Moti Moli Moli, and Moto Sii, named in order of size. Moli Moli is said to have a small crater of its own containing fresh water, a lake within a lake. Close on our left, on the south-south-east of the island, was the oddly shaped barren peninsula formed nine years ago, from which dense clouds of white smoke-like dust and sand were being driven by the wind into the big lake.

Having refreshed ourselves with many green coconuts, we started down for this spot, descending by a steep ravine-like path which quickly brought us into the land of desolation, the sudden edge of trees and rich undergrowth stopping dead like a wall, so that one step brought us out of a garden, as it were, into the desert. We first crossed an area of stones and cinders lying on apparently hard mud; and, having

passed this, we paused again for a little on a sandy summit, which completely overlooked the whole scene of activity, at a height of 373 feet, and sketch-book and camera were quickly at work. The hill dropped down very steeply below us, with a few small casuarinas, the first sturdy pioneers of the advancing forest, scattered on its slope. Down in the valley were the still standing white stumps of trees overwhelmed in the eruption; and beyond, on the other side of a lower smooth round hill, we could just see the circular pits with their seamed ashy sides—the nearer one broken down into the big lake, but the further smaller one separate, each filled with water—the craters of activity of August 31 and seventeen succeeding days of 1886. The whole of this scene was upheaved from what had previously been the lake bottom during that period, and forms a peninsula, with a long narrow gulf running nearly parallel to the south-east side of the periphery of the island. The natives have begun to plant coconuts on the lower ground already.

We quickly descended the steep sandy hillside to the shore of the lake, the aneroid giving its elevation as 95 feet above the sea-level. The water does not appear to be exactly salt to the taste, but rather alkaline—not very unpleasantly so—and the horses on the island will drink it, which, as there are no streams nor any fresh water but rain to be had, must be a good saving in times of drought. It is said that there are no fish in the lake, nor does there appear to be any vegetable growth, except for a small feathery plant which we saw a foot or so below the surface, growing on the edge of the sand. The lake, which is called "Vai Lahi" (or great water), is supposed to be very deep, and there is a tradition of a sounding of 100 fathoms with no bottom, which, however, requires confirmation.

There is a small white alkaline deposit a few inches below the present water-line like a low-tide mark, so that it appears as if the surface of the lake varied its level occasionally. The surface soil of the peninsula does not appear to be volcanically heated, but, on thrusting the hand into the soft black sand at the water-edge to a depth of 2 or 3 inches, it was found to be very decidedly hot—not less, probably, than 150°.

As the leaders of our party rounded one of the points of the peninsula, a great flock of wild duck rose within easy shooting distance, but had soon put themselves out of range. Unfortunately, there was no gun in the whole expedition, or no doubt we should have had something more eatable than geological specimens to show for our trip.

Another bird, said to be alone found on Niuafóu, is called by the natives "malau," and is apparently of the same order as the megapodes, as it makes no nest, but buries its eggs for hatching in the soft hot sand of this volcanic spot. It is a bird of about the size of a rather small ordinary fowl, and shape of a guinea-fowl, with a small head, and strong pink legs and feet. It is of a russet-brown colour, the head, neck, and some of the back being a dark slate. Its eggs are large, of a

dull reddish colour; a thin skin, containing the pigment of which, covers the white shell underneath, and can be peeled off without difficulty. The eggs much resemble, both in size and appearance, those of the megapode.

We at length scrambled over the last ashy ridge, and found ourselves on the smaller but separate crater basin, all the steep sides of which, 100 to 200 feet high, were deeply fissured, being composed of a crumbling material which broke away under the foot; and we sat down to lunch on the edge of the water at the bottom, which was roughly circular, and about 400 yards in diameter.

The other crater must have been much larger and probably more elliptical; the neck by which it joins the big lake has high steep sides, but the ridge which separates it from the lesser bowl is not more than 50 feet or so in height. Thus both may be said to belong to the same main orifice, but separated by a small partition.

It was now 1.30. The sun was baking down on this barren, shadeless spot, and hardly any of the wind reached us; so, without waiting long, we returned by the same route as we came to the first bare summit, the final exceedingly steep hill of loose sand being particularly exhausting. We threw ourselves down by the side of a small casuarina shrub, while a native, who had attended us as porter, went for coconuts.

The long cool refreshing drink from these soon revived us, and we were shortly mounting the steep ravine path we had previously descended, in the welcome shade of the trees, to the upper ridge. Thence we descended as steeply to the sea-coast, to the village of Angaha, where having been courteously received by the two white traders there, Messrs. Plati and Sheren, and having been shown a live "malau" bird, almost tame, in a cage, we set out, laden with the island mail for Tonga, on the homeward route. This lay along a capital road about halfway between the ridge path we had come by and the sea; and we passed many natives returning home with their garden produce for Sunday, it being Saturday night, some walking and some riding, who all greeted us with the cheerful "Malo lelei" of the Tongans as we passed them.

It would be hard to describe the extreme beauty of this road, the rich dark mould on both sides yielding a garden border of ferns and flowering shrubs, overshadowed by immense leafy trees; or where, for a considerable distance in front, we could see the path stretching along in the orderly perspective formed by the grey trunks of coconut palms, a full crop of nuts in all stages of maturity clustering under their feathery waving crests.

We at length arrived at Futu at 4.45, to find the ship waiting, and our boat lying alongside the landing-place; so, with many thanks to our guide who had conducted us all day, and after a hurried purchase of baskets of delicious green oranges, lychees, etc., from the natives, we pulled off to the ship, thoroughly agreed in having spent a most interesting and delightful day.

RECENT GEOGRAPHICAL BIBLIOGRAPHIES

By HUGH ROBERT MILL, D.Sc.

THE problem of keeping a systematic account of each literary flake in the ever-thickening snowfall of geographical memoirs becomes more puzzling every year. Attempts to solve it, either completely or partially, are made by most of the great geographical societies of Europe, and by some of the leading journals. Usually the attempt takes the form of a list of the works received by the society during the preceding month, quarter, or year. This may be a mere record of titles without arrangement or comment, or it may consist of a series of somewhat lengthy reviews of the works in question. The *Geographical Journal* has aimed at two things in dealing with the accessions to the library of the Royal Geographical Society: first, to present a classified list of every geographical contribution received, with only the briefest comments; and, second, to give a special notice in the body of the *Journal* of the more important or more interesting works.

The advantage of separating reviews and bibliographical notices mainly affects the student, to whom a clearly arranged and compact list of the most recent publications is a matter of high importance. The book-notices in this *Journal* are really instalments of two catalogues, one arranged according to subjects, the other according to the names of authors. The alphabetical order of the subject-entries, which prevails under each of the main divisions, is merely for the convenience of the printer. In a bibliography published monthly it is obvious that the space occupied should vary according to the demand upon it, and this being sometimes impossible without sacrificing the advantages of other equally important parts of the publication, various difficulties and inconveniences arise. *Petermann's Mitteilungen* gets over these difficulties by paging the critical bibliography separately from the general text, and giving the main headings in definite order in due succession, perhaps only two or three of them appearing in a single number. This arrangement is very satisfactory, especially when the volume is completed and supplied with the admirable alphabetical and subject-indexes which are provided. A somewhat similar method is employed, though the intervals of publication are longer, in Wagner's *Geographische Jahrbuch*, which contains special bibliographies of various departments of geography embracing the publications of several years.

The special purpose of this article is to draw attention to two recently published efforts to improve the recording of current geographical publications, one German, the other French.

For many years the Berlin Geographical Society issued an annual supplement to its *Zeitschrift*, containing a list of the publications of the previous year. From 1853 to 1887 this was done by the society's Librarian, Dr. Koner, and after his death it was continued by various

hands until 1890, when the publication stopped. The society has, however, resolved to resume and continue the work in a more systematic and complete manner than before, and for this purpose it has secured the assistance of Herr Otto Baschin, of the Prussian Meteorological Institute. The first instalment of the new work is now before us,* and it will quickly be brought up to date by the issue of volumes for 1893 and 1894. An attempt is made to give a complete catalogue of geographical publications in all languages for the period of 1891–92, and it is remarkably successful. The term "geography" is interpreted liberally, Herr Baschin preferring to run the risk of giving too much rather than too little. Books, maps, and articles in journals are all entered under certain strictly defined divisions, the ultimate arrangement being alphabetical according to the authors' names, or in anonymous works according to some descriptive word apparently chosen arbitrarily.

The classification adopted is first into A, General, and B, Special Geography; the latter is, of course, the more voluminous. General Geography is subdivided into eight groups: (1) Bibliography; (2) Methodology and Education: (3) General Description, including dictionaries, gazetteers, and handbooks; (4) Historical Geography in eight minor divisions, which include Biography and Terminology; (5) Mathematical and General Physical Geography in eight minor divisions—General, Cosmology, Mathematical Geography and Cartography, Geophysics, Climatology, Oceanology, Mountain Study, and Land Waters; all these are subdivided; (6) Biological Geography; (7) Anthropogeography; and (8) Instructions for Travellers.

In this scheme commercial geography comes under Anthropo-geography. The arrangement is throughout scientific; only we should be inclined to separate Mathematical from Physical Geography, treating them as two main heads, and to class "Globes, Atlases, and Maps of the Earth" along with Geographical Dictionaries and Manuals in Group A, instead of following Herr Baschin and giving them the first place under Special Geography.

Special Geography has ten great divisions: (1) Globes, etc.; (2) Descriptions of large parts of the Earth, *e.g.* Empires and Colonial Possessions taken as wholes; (3) Europe; (4) Asia; (5) Africa; (6) Australia and New Guinea; (7) Polynesia; (8) America; (9) Polar Regions; and (10) Seas. Each continent is first treated by itself under the heads: (*a*) Chorography and Travels, (*b*) Geodesy, (*c*) Physical Geography, (*d*) Biological Geography, (*e*) Anthropo-geography, (*f*) Historical Geography, (*g*) Guide-books, (*h*) Maps. Each country is then taken separately under the same heads, the ultimate classification being alphabetical by authors' names.

* 'Bibliotheca Geographica. . . . Bearbeitet von Otto Baschin unter Mitwirkung von Dr. Ernst Wagner. Band 1, Jahrgang 1891 und 1892. Berlin: W. H. Kühl, 1895.

The work has been done systematically and thoroughly, and the *Bibliotheca Geographica* promises to become the one indispensable record which the practical geographer must always have at hand. The present volume contains nearly 14,000 entries. It would be too much for human power to make it free of error; the misprints we have noted are, however, of a trifling kind. Titles from slavonic languages are given in German or French translation, but for the rest each title is an exact transcript. When a number of volumes of this Bibliography has been published, the labour of referring to them will become great, and we would suggest that arrangements might be made through the Berlin Society by which copies of the work might be supplied in sheets, printed on one side only, to those societies or libraries where the method of card-catalogues is in use. If this were done for each year's accessions to literature, the entries could readily be cut up and rearranged so that a single reference would answer the common questions as to which is the latest or the most important book on a given subject. When the Committee on International Geographical Bibliography, appointed at the Sixth International Geographical Congress, reports at Berlin in 1899, they will probably give an opinion as to how far the volumes of the *Bibliotheca Geographica* are likely to fulfil the conditions demanded. We do not think that the arrangement adopted is perfectly adapted for a bibliography dealing with many years of literature; but for the accessions of a single year it is probably the best that could be found, and the geographers of the world are laid under a permanent debt to the Berlin Society.

The Bibliography of Geography for 1894 recently published by the *Annales de Géographie*, a journal which has maintained a uniformly high standard of scientific excellence since its foundation, may be compared and contrasted with the larger German work. It consists of 1590 entries, perhaps one-quarter of the geographical publications of the year, calculated on Herr Baschin's system of inclusion; but these are carefully selected, and each title is followed by an explanatory or critical note. MM. Vidal de la Blache, Gallois, and De Margerie direct the work,* and there are thirty-nine contributors, the work being in large degree international.

Like the *Bibliotheca*, the larger divisions are grouped according to subject, the ultimate order being alphabetical; the main cleavage is naturally into General and Regional or Special. The General part is treated under four main heads: (1) Historical, in two subdivisions. (2) Mathematical. (3) Physical Geography, in six minor divisions—Geology and Orography, Climatology, Botanical Geography, Zoological Geography, Oceanography, Rivers and Lakes. (4) Political Geography, comprising four sub-heads—(*a*) Races, States, and Nations;

* *Annales de Géographie—Bibliographie de l'Année*, 1894 Pp. 294. Paris: Armand Colin et Cie. 1895.

(*b*) Movement of Population and Colonization; (*c*) Products and Ways of Communication; (*d*) Educational and General.

The Regional part is divided into Europe, Asia, Oceania, Africa, America, and Polar Regions, each subdivided according to countries or groups.

The classification is not so minute as that in the German work, and some of the divisions are consequently vaguer; but the much smaller number of entries dealt with prevents this from giving rise to any real difficulty, the object of such classification being to break up the mass of references into a number of blocks readily arranged for reference, and each small enough to present its contents at a glance.

It is, perhaps, necessary to point out the difference between a systematic Bibliography aiming at the inclusion of every publication upon a given subject, and the incomplete record which a list of accessions to a library inevitably presents. Yet, if arrangements could be made for effective co-operation, a single complete list compiled by one central authority, with numbered references, would form a catalogue for all; each individual library would only require to print an index showing the numbers corresponding to the works contained in it.

THE LAND OF THE BATAKS.*

By Baron ANATOLE VON HÜGEL.

A NEW book which gives the results of actual research in any of the less-known regions of the Malay Archipelago is always welcome, and the pleasantly written volume under consideration is no exception to this rule.

Baron von Brenner divides his book into three sections. In the first, we make acquaintance with the life of the Dutch planter, the Chinese labour employed on the plantations, and with the cultivation and preparation of the tobacco in Deli, a province in the north-east of Sumatra. In the second, the author gives, in journal form, a detailed account of his month's visit to the Batak highlands. Accompanied by a Dutch assistant, two native guides, and a number of carriers, Von Brenner left Bekalla (Deli) on March 19, 1887, and after a three days' march reached the tableland, the coast mountain range being crossed by the twelfth Kota Pass, a steep pinch near the active volcano of Si Bajak. For eleven days he travelled among the friendly Karo tribe. From the extinct crater, Tandok Benua (5970 feet), a magnificent view of the lake of Toba and of the surrounding country was obtained. On April 14, the expedition embarked in a large native canoe from Negori, a village of the Timor tribe, on the north shore of the lake, for Balige,

* 'Besuch bei den Kannibalen Sumatras. Erste Durchquerung der unabhängigen Batak-Lande.' By Joachim Freiherr von Brenner. Würzburg: Leo Woerl. 1894. Large 8vo, pp. 388. *With 2 maps, 7 plates (6 coloured), and over 100 engravings.*

the Government outpost at its southern extremity. The travellers were ill-received by the natives on the east and south coast of the large Toba island; but, though virtually made prisoners at one of the villages and deserted by their canoe-men, they reached, without mishap, their destination on April 22. From Fort Balige, a two days' ride along a good road brought the expedition to Siboga, a town on the west coast.

The third part of the book, which, in bulk as in interest, is by far the most important of the three, deals with the geography of the table-land, its history and its inhabitants. A capital account is given of the religious beliefs, the manners, and the customs of the people, including a comprehensive glossary of Batak words, both in the Karo and in the Toba dialects, with their Malay and Sanscrit equivalents. In the appendix will be found a census of the population, each tribe being registered with its dependencies, and, approximately, the number of houses in each village. The fauna and flora are briefly dealt with in two short chapters. A *resumé* of the literature on the Bataks is given, and the book is provided with an index; but both require careful revision, as, in their present form, they are by no means complete or trustworthy.

GEOGRAPHY.—The region now inhabited by the independent Batak tribes lies in the interior of the north-westerly half of Sumatra, that is, between 98°–99° 35′ E. long. and 2°–3° 25′ N. lat., covering an area of something like 2320 square miles (6000 square kilometres), with a population estimated at 262,000. The province of Deli lies to the north of this territory, the outlying districts of Atchin hem it in on the west, and other less-known districts under Dutch rule form its eastern and southern boundaries.

The entire territory lies on an elevated plateau, a mean height of 4100 feet (1250 metres) above the sea-level. It is reached by rough tracks, leading over passes in the surrounding mountain ranges, which are of considerable height, some of the most conspicuous peaks attaining an altitude of over 8000 feet. Dense forests clothe their seaward slopes: but their summits, many of which are volcanic cones, are mostly bare.

Portions of the scenery of the plateau resemble the interior of Java, in the numerous isolated hills and smooth volcanic cones that rise abruptly out of the flat country. Chief among these are the extinct craters, Si Ngálang (5900 feet) and Tandok Benúa (5970 feet) —two cones similar as twins—which guard the northern shore of the lake. This character is most pronounced in the extensive Karo Timor plain (north of the lake), the view to the north of which is bounded by mountains, where, in addition to the 7930 feet (2417 metres) high Si Nabun (Spirit Mountain), an imposing almost constantly smoking mountain, there are the following half-dozen striking peaks: Si Bajak, Baros, Liang, Tenaro, Mariah, Si Manuk, and Dolok. Along the boundary of the Pákpak country to the north-west of the lake, the mountains are welded together into one confused range by a number

of ridges and smaller hills; and here also considerable peaks are not wanting, Longsuáten, the loftiest, being 8200 feet (2500 metres) high. It is probably an extinct crater, as the natives tell of a lake upon its summit. Further south the active volcano Pusuk (6580 feet) forms a striking promontory on the north-western shore of the lake; and Von Brenner heard of yet another, Si Nkiring by name, of considerable altitude, further inland to the north. Ranges of hills and mountains, that follow the long axis of the lake, stretch close along its western and part of its eastern shore.

The plateau is well watered: rivers and streams abound, though they are rarely visible from any distance, as, alike in hill or plain, their channels lie in deep cuttings. Three distinct river-systems may be traced, a northerly, an easterly, and a westerly, which, ranged fan-like round the lake, form the head-waters of the many rivers which flow east and west down the mountain-sides, and irrigate the low-lands on their way to the Indian Ocean or to the Straits of Malacca. The Lau Hrnun, lower down known as the Simpang Kiri, is the only navigable river in the Batak Lands. Its course is interrupted by the waterfall of Liang Bangin; but with this exception it is navigable for sampangs (small canoes) from the village of Hrnun, in the south-west corner of the Karo lands, to Singkel, on the west coast, where it joins the sea. The upper course of the Hrnun, which takes its rise not far from the volcano Sinkiring, lies in a deep gorge, the left side of which towers several hundred feet over the right. At five places the rushing stream is crossed by means of a basket slung on a rattan cable, which spans the gorge. This stream, the main artery of the western river-system, is fed by many tributaries. Of one of these, the Lau Binalsa, the natives speak as the "Spirit River," because, "without any apparent cause, its waters rise and assume a blood-red colour, when a human sacrifice alone will pacify it."

But the most striking feature of the tableland is, without doubt, the great sheet of water, known to Europeans by the name of Toba, of which, though only as a name, geographers have been cognizant for more than a century. It lies about 2560 feet (780 metres) above the sea; and, trending from the south-west to the north-east, has a length of about 50 miles (80 kilometres), with an average breadth of 16 miles. It is oblong in shape, and has a considerably indented coast-line. The natives call it by two distinct names, for the central third of its length is so blocked by a large and populous island as to divide it into two basins—a northern and larger one, Tao si Lalahe, or Laut Tawar, and a smaller southern one, Tao Muwara. The island consists of a compact mountain range of gentle contour, attaining its greatest height, 5200 feet (? 2640 feet above the level of the lake), in Deleng si Pira. Of the narrow channels which separate this island from the mainland, Si Gaul, the eastern, is the only one that is navigable at all times, Kota

Raja, the western, being so shallow as to be fordable on foot when the water is low; indeed, during the dry season rice is grown in its bed. The island apparantly owes its name of Toba to Von Brenner, for until his visit it had been thought to be a peninsula, as, unlike the small islands on the lake, of which there are several, it has no native appellation, but is only known by the names of the districts into which, like the shores of the lake, it is divided. The lake has its outflow at the head of the great bay of Balige, in the south basin, in the fine stream Pasir di Babano, which, after a short course, forms a considerable waterfall, and eventually joins the sea at Tandjong Balei. There is, however, no corresponding influx, for no river flows into the lake; and, the insignificant streams and brooks that run their short course down its steep shores are the only visible sources that feed its wide waters—a large expanse indeed considering that, even discounting the space occupied by the great island, the lake's area, as given by Von Brenner, is three times that of the Lake of Constance. The frequent and regular changes in the hue of the lake is a peculiarity worth mentioning. Of a morning, the surface being then mostly unruffled, it appears of a fine dark blue, which changes to a greenish tint along the shores: by noon it is of a leaden grey; and of an afternoon it is whitened with foam by a fierce wind, which here blows with strange regularity. The lake appears to be remarkably poor in fish, and those seen in the hands of the natives were all small, and belonged to two species only. However, the legend which tells of a fisherman who, fishing in the lake, caught a ten-foot fish, and promptly died through fright at sight of such a monster, may indicate that some large species of fish inhabit the deeper water. Lake Toba is not the only lake in the district; but the others are all small, many of them mere mountain tarns.

The geology of the tableland is briefly dealt with. Trachyte (anderite) appears to be the prevailing rock; quartz, shale, and limestone (the latter occasionally very rich in fossils) were also noticed. The soil is loose and porous, composed largely of scoriæ, in which water sinks very rapidly, and to which the deep channels of the streams are attributable. The natives appear to be cognizant of the following metals: gold, silver, copper, tin, lead, and iron; but of these, being ignorant of the art of smelting ore, they are only able to obtain gold, which they wash from the sands in the river-beds. Though far from abundant in this condition, there seems to be reason for believing that gold exists in remunerative quantities in some localities within the confines of the Batak lands.

The fauna and flora of the district cover but a few pages each.

Large game, such as elephants, rhinoceroses, and tigers, are restricted to the wooded and jungle tracts of the Raja and Timor lands, and Von Brenner confirms the observations of previous travellers, as to the paucity of animal and plant life on the actual plateau

land. Deer, wild pigs, and sun-bears find no peace or shelter in the cultivated plains, and are therefore only to be found, and not in large numbers, in the small patches of wood which here crown a few of the mountain summits. Monkeys and apes are confined to the forest regions: those inhabiting the copse which surrounds Purba are the descendants of some pairs that were brought many years ago from Deli, and they are considered as sacred. An interesting fact is the great difference that exists between the animal life of the actual plateau and that of the littoral regions of Toba. According to Dr. Hagen, the fauna of the lake resembles that of the Sumatran coast. Von Brenner himself saw but three species of birds on the lake; namely, the purple heron (*Ardea purpurea*), the familiar moorhen (*Gallinula chloropus*), and the little dabchick (*Podiceps minor*), which last-named bird, by the way, he somewhat rashly describes as a "*kleine Ente*." He further notes a strange absence of birds of prey. Quails (*Turnix punax*) are frequently met with, and several species of pigeons, the small rice-birds (*Munia*, etc.), larks, and our common sparrow—brought to Deli from Singapore but a few years before his visit—are also mentioned. All the rivers, as well as the lakes, appear to be surprisingly poor in fish—so much so that, during the whole of his wanderings, Von Brenner failed to see a single example in their limpid waters. Reptiles are by no means plentiful, neither do insects abound. Mosquitoes are very scarce, but the vermin which swarm in the native houses quite make up for their absence.

The vegetation of the plateau land is not luxuriant: indeed, it is very poor when compared with that of the coast lands or of the forest regions. This poverty is no doubt due to the centuries during which the land has been under cultivation, as well as to the dry nature of the soil, which, instead of being irrigated, is actually drained by the many rivers and streams of the region, as these almost invariably have their beds in cuttings far below the level of the plain.

The author gives a graphic description of the aspect of the country, of which the following is a brief *resumé*.

In the Karo-Timor districts, the distant landscape of endless green plains, covered solely with plants of low growth, reminds one sometimes of inhospitable steppes, sometimes—and this especially where villages are numerous—of a friendly and even fruitful pasture land. Greater variety of plant life enlivens the copses or the woods which surround the villages: and in the deep cuttings which the streams have dug out for themselves, a good deal of the tropical character crops up in the vegetation. The contrast of the luxuriance of the gorges, however, only helps to emphasize the dull, poverty-stricken look of the plains—the wide stretches of *lalang* adding greatly to this forlorn appearance—and makes one realize how ages of unthoughtful cultivation have impoverished the land. Very different from these Karo-Timor lands must be the yet closed

regions of the Raja and Pak pak tribes, where virgin forest still covers much of the soil. On the other hand, the slopes along the shores of Toba, as well as those of the large island, both under the sway of the Toba tribe, are poor, bare, and sterile—so much so that even from afar the red colour of the island proclaims how bare the soil is of vegetation. But a gladdening sight are the *sawas* (rice-fields), soon after the crop has been cleared off the ground, transformed, as they then are, into veritable flower-beds by the lovely violet-coloured blossoms of the *Monochoria vaginalis*. These great sheets of colour lend a most wonderful charm to the scene, especially where the land, as is so often the case, has been cultivated in terraces. Among flowers that pleasantly reminded him of home, Von Brenner enumerates a violet, a forget-me-not, a ranunculus, and a honeysuckle.

Among a host of trees and shrubs made use of in various ways by the Bataks, the most noteworthy are the *areng*, or sugar-palm (*Arenga sacharifera*), from which wine, vinegar, sugar, syrup, writing-styles, tinder, water-pipes, and fencing and roofing material are derived; the *gambir*, an astringent yellow preparation much esteemed for mixing with the betel and *siri*, but which is also exported to be made up into paint; the citron, of which there are three varieties, is valued for the black varnish (produced by the juice of its burning wood being mixed with its own ashes) that is used to blacken teeth, as also for the preparation of ink; and the bamboo, as already shown, perhaps the most indispensable of all growths to the natives. The benzoë (*Styrax benzoin*) and the camphor both grow to perfection in the lower districts of the Batak lands, the latter attaining at times a height of 200 feet. The produce of these trees constitutes the most valuable articles of Batak trade, and to the former the territory owed its renown among the ancients, who named it "Benzoë Land." Coconut trees are scarce, and of very stunted growth, producing only small nuts.

The author, in summing up the impressions derived from his visit to the highlands, expresses his surprise that so promising a land should have been left in its primitive condition, and this despite the fact that the Dutch, so long ago as 1878, extended their frontier as far as the south shore of the lake. With an excellent climate, one in which Europeans can do a heavy day's work, the region is in every respect suited to the breeding of cattle and horses; and in the tropics, at such an elevation, the growth of many profitable crops (probably including the vine) is a certainty. There is much valuable timber in the still existing forests, and the probable mineral wealth of the country should also be taken into account.* This promising and long-coveted land actually

* That efficient plantation hands could be obtained on the spot—a most important point—the facts mentioned by Von Brenner (p. 352) would seem to prove. He says that in recent years many of the Bataks have left their homes to engage themselves, for a term of years, on the plantations of Deli, and that the number of those who do so is yearly increasing

remains in the hands of ill-disposed tribes, whose country no European is allowed to enter, and who, within sight of the Dutch outposts, continue their cannibal practices and defy the representatives of the Dutch government. And yet, in the author's estimate, a steamer with two guns and twenty men would in its first cruise make the Dutch the masters of the lake, and a second fort with a small garrison erected on its northern shore would secure the situation. The effect of this extension of the Dutch sphere of action would have far-reaching and salutary consequences; not only would the subjugation of all the independent tribes be certain, and that, probably, with small loss of life, but the long-desired connection between the eastern and western provinces would be established. "This acquired land," he observes, "would form a wedge to separate Achin from those untrustworthy tribes of Sumatra, who, like a keg of powder near unprotected fire, cause a constant danger to the rest and safety of the land; and, further, the christianizing of these districts (protection for the missionaries being then secured) would mitigate the harmful influence of Mahometanism. At the same time, a base of operations against Achin would thereby be created, which, thus being held in check on two sides, would be the more easily subdued." The latter consideration is of no small importance, for the war with Achin has already lasted in a desultory fashion for eighteen years, and has cost the country very dearly, not only in men and money, but, what to the colony is of far more importance, in *prestige* in the eyes of the natives. With these views and hopes of the author, every one who has paid more than a passing visit to the Dutch East Indies will most heartily agree.

PEOPLE.—The name by which these people designate themselves differs somewhat with the dialects spoken by the different tribes, and Batik, Batta, and other forms of the word used by various travellers, may therefore all be correct. The chief clans are five in number: (1) the Karo, inhabiting the plain to the north and north-west of Lake Toba; (2) the Timor, to the north-east of the lake; (3) the Raja, of the country between the latter and (4) the Toba of the eastern and southern shores of the lake and of the large island; and, lastly, (5) the Pak pak, of the densely wooded district to the west of the lake.

The Batak are of Malay stock, forming part of the Indonesian or pre-Malayan branch; in whom, unlike the Malay of the coast, the Mongol element is less marked than the Caucasian.* Von Brenner speaks of considerable differences in the colour of the skin and hair, the latter varying from black to brown, even to red. Neither did he find the features universally Malay, for in the south of the Toba island the type is Aryan, with well-formed noses, often aquiline. Of somewhat small stature, the men are strongly built, and beardless, or almost so; the

* Keane, *Journal Anthropological Institute*, vol. ix. p. 285.

women are not unpleasing in appearance, and, when young, graceful, their fine light coffee-coloured skins giving them a fresh complexion rarely seen in Malays.*

Of diseases, small-pox is by far the most serious, appearing in epidemic form, with such regularity (nine to twelve years) that the people use its recurrence as a measure of time. Leprosy exists, and those afflicted with it are kept apart in special houses. Syphilis, though of recent introduction, has done much mischief. A peculiar skin-disease prevails, and is specially virulent among children; gôitres are common.

Von Brenner describes the men as intelligent, though indolent and fond of gambling. Obstinate, suspicious, and cruel by nature, they yet evince a certain gentleness of feeling, and if once jealousy and suspicion are allayed, their fidelity is secured. Excitable by nature, anger, nevertheless, is rarely if ever shown; in fact, surprise and curiosity are the only emotions not under control. They are superstitious, somewhat shy, and nervous. They dreaded being photographed, as they thought that their "shadow and spirit would be caught and kept prisoner in the little box." Men love their families and homes; women are quiet and modest in presence of men, and are devoted mothers and faithful wives, though as girls they are allowed much liberty and licence. Bataks are talented speakers, and love talk and discussion. They are a civil, ceremonious people, never wilfully giving offence, and in conversation a multitude of courteous titles are used, which vary according to the speaker's rank and position; this holds good also between men and women, and complicated and manifold indeed are the terms of address between relatives.

(To be continued.)

JOURNEYS AND EXPLORATIONS ON THE PILCOMAYO RIVER.

By Lieut. O. J. STORM, late Hydrographer to the Argentine Government, and Professor at the Naval School in Buenos Aires.

The Pilcomayo is a tributary of the river Paraguay, and rises in the interior of the Bolivian highland, traverses afterwards the immense plains of the Gran Chaco in a south-easterly direction, and falls into the Paraguay river at 25° 21′ S. lat. six miles below Asuncion, the capital of the Republic of Paraguay.

A glance at the map of South America will illustrate the importance of the Pilcomayo as a commercial high-road if it were navigable, and of late this river

* When considering the physical characteristics of the Bataks, future observers would do well to keep in mind two possibly important factors bearing on the question: (1) the periodical commercial visits of the Dyaks mentioned in Von Brenner's journal; and (2) the fact, also mentioned by him, that the Batak country is the usual refuge of Chinese coolies when they run away from the plantations. The majority of these poor fellows are killed and eaten, but a certain number escape and establish themselves among the people.

also claims attention as the boundary-line between the Argentine and Paraguayan Chaco.

Ever since the early days of Paraguay's discovery the Pilcomayo has excited a great interest, and innumerable have the attempts been to explore the river, but as yet no man has navigated it in its whole length, and the part comprised between 20° and 24° S. lat. is still practically unknown, and it is only in the few last years that we have an exact knowledge of the lower course of the Pilcomayo. The cause is partly the natural difficulties which the explorer has to contend with, such as shallowness and rapids, and partly the persistent and violent resistance of the Indians to the "white" man's invasion of their territory.

Space does not allow me here to give a *resumé* of the various endeavours made to explore the Pilcomayo river, and I shall only mention the expedition of Dr. Jules Crevaux of the French navy, which was undertaken at a comparatively recent date (1882), and created much sensation, both in South America and in France, on account of its tragical end. Dr. Crevaux started from Bolivia accompanied by fourteen men embarked in canoes, with the intention to descend the Pilcomayo. In the beginning all went well, and the Indians he met seemed to be of friendly dispositions, but they had already beforehand secretly resolved to kill the obnoxious white intruders. On his arrival at the Indian village Cabayú-repoti, not very far from the place of departure, Dr. Crevaux and his party were suddenly attacked by the savages, and he and all his companions, except a boy, were murdered.

Two years later (1884) the Argentine Government opened a military campaign against the Chaco Indians. Besides the main body that advanced by land under the command of the minister of war, there also were despatched two fluvial expeditions, one by the river Bermejo, and another by the Pilcomayo. The commander of the latter was Captain Feilberg of the Argentine navy, and, besides assisting in the military operations, the object of the expedition was at the same time to make a hydrographic survey of the river, for which purpose I was attached to the party. We penetrated some 300 miles, but were at last forced to retreat on account of low water.

The navigability of the Pilcomayo continued still to be an open question, though our experience from this expedition, as well as that of all others, proved pretty clearly that the river was not navigable for commercial purposes. This I also sustained in a lengthy controversy against the French traveller M. Thouar, who previously (1883) had crossed by land the Gran Chaco from Bolivia to Paraguay in company of a Bolivian expedition, and who ardently advocated the advantage of the Pilcomayo as a high-road to Bolivia. The question was finally submitted to the Institute of Geography in Buenos Aires, which, however, did not arrive at any decisive conclusion.

M. Thouar offered to take a vessel of eighty tons, drawing 2 feet, from Asuncion to Bolivia at any time of the year, while I contended that only under exceptionally favourable circumstances, and with a specially built boat, would it be possible to reach Bolivia by the Pilcomayo. Here the matter remained for several years, till in 1890, through the generous assistance of Mr. A. Busk, I was enabled to show practically the truth of my assertions. This gentleman volunteered to build a small steamer in case I would undertake a new exploration of the Pilcomayo, an offer I at once accepted. The steamer was built by Messrs. Cockrane & Co., and shipped to Buenos Aires in three sections. The *Explorer*, as it was named, was a flat-bottomed stern-wheeler built of galvanized steel, length 46 feet, beam 11½, and draught when loaded only 8 inches. The boiler was placed in the bow, and the engine with a single non-condensing cylinder aft. The speed was very inferior,

specially when burning wood, and did not exceed 5½ knots. I obtained the necessary permission from the Argentine Government to explore the Pilcomayo river, and the Governor of Formosa [the Argentine territory south of the Pilcomayo] was instructed to assist me to the best of his ability.

The *Explorer* proceeded up the Paraguay river to Asuncion, and here the final preparations for the expedition were completed. It was very difficult to get the natives to accompany me, but by offering double wages I finally succeeded in engaging sixteen Paraguayan "peons"; the Europeans numbered six, making a total force of twenty-two men. My first lieutenant was a Dane, Mr. F. Freund, C.E., a man of great experience in Paraguay, and who was a most valuable companion and assistant during the whole expedition. The late Dr. Thomas Morong of the Smithsonian Institute accompanied the expedition as a botanist. Before I give an account of our expedition, I will shortly explain the hydrographical conditions of the Pilcomayo.

The river has an average width of 30 yards, and its banks are 4 to 5 yards high, covered in some parts with dense forests, while in others the aspect changes into vast plains dotted with palms. There also exist extensive swamps. The depth is very variable, and entirely dependent on the rainfall. The course of the Pilcomayo is extremely tortuous, with very short and sudden bends, making it difficult even for a small steamer like the *Explorer* to wind her way through. The overhanging trees from both sides, and specially the numerous *raigones*,* offer great obstacles and even dangers for the navigation of the Pilcomayo. In some parts the raigones are so abundant that the river-bed at low water looks like a forest of dead trees. We had to stop at every moment to cut our way through, and at times the men scarcely were out of water the whole day. It is all hard-wood, and even the best axes will break. Another serious impediment is the rapids, with very shallow water and strong current. In order to pass these, we had to lighten the vessel and pull her over with warps or even tackles, and some of the men in the water pushing on each side. In some instances we first had to dig a channel in the hard *tosca* before executing this manœuvre. Our principal food was sun-dried beef (*charque*), which in itself is not very palatable, but has the great advantage of weighing little and keeping well. Boiled with beans and some extract of meat, the charque makes a very nutritious dish. We carried very little tinned provisions, to be used only in cases of illness or when unable to light a fire. The rations were distributed every morning by one of the officers, and watch was always kept on the provisions to prevent the men from stealing. We carried a small medicine-chest with written instructions. We were very fortunate with our medical treatment, and though once half the crew were laid up, they eventually recovered, and we all returned in good health.

We only navigated at day-time, and even so we had the greatest difficulties in not running on the raigones hidden under the surface of the water. Military discipline ruled in the expedition; every man had a rifle and twenty rounds of cartridges, and we all slept with our arms beside us. Besides the *Explorer*, we possessed one big canoe, *La India*, and one small, *La Negrita*, which were taken in tow; also a portable canvas boat that was very useful for sporting purposes. In narrow and difficult waters six men were put on board *La India*, punting her against the current at a very good speed.

On January 6, 1890, we left the port of Asuncion, where a crowd of friends and spectators had assembled to see us off, perhaps for ever, as many believed we should never return alive from our hazardous undertaking. At the mouth of the

* *Raigones* is the Spanish word for "snags."

Pilcomayo we shipped the last provisions, and on the morning of the 9th we steamed slowly up the river, which was high and the current scarcely perceptible on account of the flood from the Paraguay river. A couple of days' journey, however, brought us beyond the influence of the Paraguay river, and I was soon convinced that the Pilcomayo itself was very low, though it was just the season for the yearly rise. It took us twelve days of toilsome navigation to reach Las Juntas ("the junction"), a place 120 miles from the mouth, and where the two arms into which the Pilcomayo is supposed to divide itself at about 22° S. lat. again join. There is no doubt as to which of the two arms is the bigger, namely, the western or right one; but the Argentines, from political reasons, maintain that the left branch is the real Pilcomayo. At Las Juntas I encamped in order to overhaul and repair our vessels, which had suffered much during the voyage, and also to give ourselves a well-earned rest. In spite of the exceedingly low state of the river, I resolved to continue the exploration, because I knew from experience that the men would soon get demoralized if we remained idle waiting for a flood to set in.

The next day we recommenced our exploration, following the right branch, but made very little progress on account of the shallowness of the river. Working from sunrise to sunset, with but little rest in the middle of the day, we some days only made a mile and a quarter. The officers set the example, and we passed the greater part of the day in the water, under a scorching sun, removing raigones or hauling the steamer over the rapids. Soon half the crew was on the sick-list, some with fever, and some with dysentery from the bad water.

One evening as we encamped I half despaired of being able to continue the following morning, when a torrential rain set in and kept on during the whole night, causing the river to rise with extraordinary rapidity and force. As the waters covered every mark, I had to calculate the rise, which I estimated at about 10 feet. We loaded the steamer up with wood, and, full of joy and hope, we headed up stream at full speed. The river had changed almost past recognition; all the raigones and rapids had vanished as by magic. What a difference in the navigation from the day before! With the exception of the engineers and the helmsman, the rest of the crew could for once enjoy the *dolce far niente*. That day we made 20 miles, which was the best run against the current we made during the whole expedition. But our happiness was of short duration; a few days later the depth commenced to diminish, and the ghastly raigones once more made their appearance. However, on February 10, after great exertions we reached close to La Espera, 300 miles from the mouth, where we in 1884 had had our encampment, but here it was impossible to advance any more; even *La Negrita*, in which I made a reconnoitring up river, had to be hauled over the "tosca" banks. Very reluctantly I made up my mind to wait patiently for the annual rise, which, according to the hypothesis of the geographers and others conversant with the subject, already ought to have made itself felt; but, alas! this rise never appeared in the six months we stayed on the Pilcomayo. In fact, contrary to all theory, this river has no periodical fall and rise.

Already further down we had seen quite fresh tracks of Indians, and at La Espera we found unmistakable indications of their presence, which, of course, increased our vigilance; we made several attempts to find their wigwams, but without success. We now made preparations for a prolonged stay, pitched our tents and disembarked all our provisions and implements. We also constructed a ranch for the officers on a long sandbank in the middle of the river-bed, where we were less exposed to the troublesome insects and the heat than on board the *Explorer*.

I had all the stores weighed, and found that our provisions would last for sixty

days. The distance to the nearest Bolivian village I presumed to be 500 miles, which we with high river ought to cover in thirty days; besides, I trusted to be able to buy provision from the Indians further up. Taking everything into consideration, I calculated that we could afford to wait a month for the river to rise. Day after day, however, passed without the slightest change, except that the river always fell, the provisions diminished, and the mosquitoes augmented. We beguiled the time as best we could, specially by shooting, but gradually the game became scarcer, and we had to look for it at considerable distances from the encampment, which was not without danger on account of the vicinity of the Indians. Fortunately, we had a good stock of books, and our botanist's piles of old *New York Heralds*, which he used for drying his plants, were devoured with avidity. We also played at chess and at other games, had target-shooting with prizes, etc.

The heat, specially at night, was very oppressive, but not to be compared with the annoyance we suffered from the swarms of insects which harassed us day and night. Wind and sun were the only things which would moderate their attacks, and we therefore used to promenade in the broiling hot sun, fanning ourselves with kerchiefs in order to keep our enemies away. I shall not try to make a scientific description of our tormentors; it suffices to say that we discovered six different classes of mosquitoes of various sizes and colour, some even walked with their feet in the air. There were also many reptiles, of which the rattlesnake was the most objectionable, besides the tarantula and the big bird-spider.

After a stay of three weeks in Las Penas ("the sufferings"), as we significantly named our encampment, there was still no sign of an approaching flood, and I realized that we should have to send for some provisions in order not to abandon the exploration and the steamer. After consulting with Mr. Freund, we agreed that he should take *La India* and six men with provisions for fourteen days, and go down to Asuncion to fetch a new crew and fresh stores. We picked out the most useless among the peons to go in the relief expedition.

On March 3, we bade Mr. Freund and his comrades good-bye with a heavy heart, as it was doubtful whether we should ever meet again. They had before them a journey of 300 miles and back by a dried-up river, and we on our side, twelve men all told, of whom seven were rebellious half-castes, were left with scanty provisions, and practically cut off from retreat should we be attacked by the Indians, the river having fallen so much that the *Explorer* could not float. I calculated that Mr. Freund should be able to get back in five weeks' time—that is to say, about April 10—while our provisions, by exercising great economy, should last a week over this term. In case the river should rise, I had agreed with Mr. Freund to go down in the *Explorer* and meet him at Las Juntas.

The days now commenced to drag on with a maddening slowness. We never went about alone for fear of Indians, nor did we absent ourselves for great distances from the encampment. Almost every day the sky looked threatening, but invariably it cleared up without the rainfall for which we so anxiously longed. We used to get our drinking-water from a neighbouring pool, but it gradually dried up, and we were then obliged to fetch the water every morning from a small brook 6 miles up the river. The provisions also diminished with an alarming rapidity, and at the end of the month our stores of flour, peas, and beans were finished, only the tough "charque" remaining, which we prepared together with palm-cabbage. We also shot an alligator, the only one that had remained after the drought set in; by cutting off the tail, and boiling it before roasting, we got a very eatable dish of fresh meat, in spite of the repugnance which these reptiles impress on the mind. Under these circumstances the time for the return of Mr. Freund expired. The river was still exceedingly low, and this might count for his

tardiness, though I in my calculations had made good allowances for it, and I therefore feared he had been attacked by the Indians on his voyage down or up.

On April 14 we had provisions left for only one day more, and I was now forced to leave the steamer and go down the river in search of our companions and of food. All the superfluous arms and implements were buried in the bank, and the ammunition together with $200 in silver enclosed in the boiler. The chronometers and astronomical instruments I carried along with me in a box on board the *La Negrita*, manned by four men; one man embarked in the canvas boat, and two in a canoe which we ourselves had scooped out of the trunk of a tree; the rest, four men, had to walk on foot along the bank. The Pilcomayo was so low that we, at every instant, had to jump out of the canoes and drag them along the dry river-bed. Each man was only allowed to take one set of clothes, his rifle, and a "poncho." The weather was hot in the day-time and cool at night, and one evening we were surprised by a heavy hailstorm. As soon as we got some miles below Las Penas we found abundance of game, mostly birds; but as we by this time were short of cartridges, we had to be very careful when shooting. I had arranged with Mr. Freund that he, at certain places, should leave news of his voyage, and, in fact, at La Mora Negra I found in a bottle a slip of paper announcing his safe arrival at that place on his way down. This message was a great relief to me and all of us. After a couple of days, the men on foot suffered from sore feet and swollen limbs, and were unable to proceed any further. We tried to build some rafts of dried palms, in which they made but slow progress, running into raigones at every instant.

In the afternoon of the fifth day, just as we turned a bend of the river, we suddenly came on Mr. Freund and his party, drawn up in a line, and ready to receive us with a shower of bullets; they had heard some shots, and believed that the Indians had killed us and had seized our arms. For all that, our appearance was far from reassuring, and we looked more like savages than white men in our scanty and torn clothes. The joy at meeting each other is not to be described; only the old peons, who had been with me, were very crestfallen, as they had hoped to reach Asuncion and be paid off. Half imploring and half threatening, they asked permission to continue the voyage down stream by themselves. I immediately had all the peons drawn up, and told them briefly that I had not the slightest idea of giving up the expedition, nor allowing anybody to abandon it, and whoever should try to do so would do it at the risk of his life. This had an excellent effect, not only on the old peons, but also on the new ones that Mr. Freund brought, and who had behaved rather independently. Mr. Freund was accompanied by a friend, Mr. Noble, and eight peons. Besides the old canoe, *La India*, he also brought a new one, both loaded with provisions.

The cause of the delay was simply the exceedingly low state of the river. The same day that we met, a rise had set in owing to some rain, and in high spirits we again started up river to return to the *Explorer*, which we reached on April 24, after an absence of ten days. The previous days we had seen big prairie fires, which indicated the presence of Indians; but, fortunately, we found the steamer and everything on board her just as we left them.

The total rise of the river at Las Penas was 14 inches. The arms and implements were again unearthed, and on the following day the whole expedition, headed by the *Explorer*, proceeded up stream. We passed the river Dorado, a tributary of the Pilcomayo, and reached the rapids which had stopped our expedition in 1884, and, though the waters were now much lower, we succeeded in passing them after having cut a channel. As we advanced the presence of the Indians got more marked. In the night we saw their watch-fires and heard their war-whoops; we also

came on several abandoned wigwams. Twelve miles above these rapids we found a waterfall 5 feet high. After having examined the ground, I resolved to excavate a slip in the left bank; placed four palm-trees longitudinally, 3 feet apart, the whole length of the sloping terrace, and short rollers, also of palm-trees, on the top of these. On the fourth day after we commenced the work, we gave the first pull with the tackles fastened to the bow of the *Explorer*, and, to our great satisfaction, she gradually ascended the slip, and the next day we were able to launch her above the fall, which we baptized "Salto Palmares," from the immense forest of palms which exist there. Thus we had overcome this obstacle, but a still more serious one was in store for us. A couple of miles farther up, the Pilcomayo converted itself into a big swamp all covered with rush, and extending as far as the eye could reach. In the small canoe I penetrated about a mile into the swamp, and ascertained that, unless there was open water farther up, it would be impossible to penetrate with the *Explorer*. Naturally enough the men were rather disheartened, and the night before we were to enter the swamp two of the peons disappeared. This time they had not been able to steal any of the canoes, but had left on foot. Accompanied by a couple of men, I set off in pursuit of them, but was unable to track them in the dense forest. I knew, however, that they had but a poor chance of finding their way back to civilization alive. About their fate I shall relate later on.

As soon as we entered the swamp the engine was of no use any more, and we could only advance by warps and punting. After great efforts we penetrated into a sort of small lake with comparatively open water, and here I determined to leave the steamer and explore the whole swamp in canoes. On May 16 I started, accompanied by Mr. Freund and eight men in *La India* and *La Negrita*, provided with food for thirty days, and 150 rounds of ammunition per head. The steamer I left in charge of Mr. Noble, to whom I gave written instructions how to proceed in the different cases that might present themselves. In case of a rise, he was to follow us up; while if the river should fall, he should return to Salto Palmares, and there wait our return till he had only provisions left for fifteen days, and then save himself and leave us to our fate.

The Pilcomayo seemed at first to disappear in the swamp; this, however, was not quite the case. The river wound its way through the morass, and was conspicuous by the height of the grass and abundance of aquatic plants with which it was filled. In some places this "green" river had spots of open water with a depth of about 6 feet, and an almost imperceptible current. The average width of the swamp was 5 miles. We first tried to follow the river, but soon found that it was easier going through the swamp itself, where the grass was not quite so dense, and was covered with about 10 inches of water. Partly pushing and partly punting, we advanced close upon 2 miles before darkness came on. Of course there was no *terra firma* where to encamp, and we had to turn in all standing in our canoes. The nights at this time of the year were quite fresh, and the thermometer would be as low as 42° Fahr. We forced our way through the swamp for three days, and still the condition of the river did not improve; but in the morning of the fourth day it gradually changed into an open stream, where we made good progress with the poles, expecting soon to get out of the dreary morass. However, a mile and a half further up the river again closed in, and divided itself into three branches, which each gradually disappeared in the swamp. This was now so overgrown and shallow that even our small canoe could make no headway. We successively tried the different arms, all with the same result—impassable! It was evidently of no use to continue any more in the canoes, but at the same time I did not like to come back with the intelligence that the Pilcomayo disappeared, without knowing how or where. I determined to leave the boats in charge of a few men, and undertake an exploration by land. After

wading through water and mud for an hour and a half, we once more trod firm ground, and directed our steps northward, following an Indian footpath which led us to an encampment, where we found plantations of pumpkins and Indian corn.

We saw quite fresh prints of horse-hoofs, and it was plain enough that the Indians were about. A little later we also discovered two of their scouts in a tree; we made some friendly demonstrations, but the savages soon disappeared. Even if our number should have permitted us to engage in a fight with the Indians, I should have tried to avoid it as long as possible, and my policy was always to establish a friendly intercourse with the Indians, in order to get some information from them regarding the Pilcomayo; but during the whole expedition we never were able to get near them. They evidently believed us to be the van of a military expedition, similar to the one which in 1884 had punished them so severely.

About 12 miles from our starting-point we again found the Pilcomayo, which here presented a similar aspect as below the morass. We followed its course in the direction of the current, in order to make sure that it was the real Pilcomayo, and soon sighted the swamp, which made a big bend to the south-west.

We had now achieved the object of our land-exploration, and returned to our canoes, in which we once more made an attempt to penetrate in the direction where we had refound the Pilcomayo, but in vain. The swamp was almost dry, and quite impenetrable, and we might just as well, or easier, have hauled our canoes over land; but this would be an operation that required more time than our stock of provisions would allow us, if we were to continue the exploration above the swamp. Moreover, the waters had been falling ever since we left the *Explorer*, and for this reason alone I should have to beat a hasty retreat. So on May 29 we started on our return voyage to the steamer, which we reached three days later at Salto Palmares. Mr. Noble and his party were all safe, and had commenced preparations for repassing the fall. These we completed, and soon got the *Explorer* over.

The river by this time had fallen 24 inches since we first arrived at Salto Palmares, and was still falling at the rate of 3 inches every 24 hours, and I feel assured that, had we been a few days later, I should have had to leave the steamer behind. As it was, the bottom of the *Explorer* grated the tosca-banks as we shot the rapids, driven by both engine and current. However, the raigones, as always, proved to be the most dangerous obstacles; and, after having run into one, we got the bow knocked in, and had to run the steamer ashore in order not to sink. A slip was soon constructed, the forepart was beached, and the damage repaired.

Passing the Dorado river, we, strange to say, found it swollen, and consequently, from this point downwards, the Pilcomayo was comparatively high and the navigation easy. A few days later we approached the place where we had met Mr. Freund and his relief-expedition, when suddenly a human being of a wild and ghastly appearance rushed out of the woods, and, falling on his knees, implored to be taken on board. It was Julian, one of the deserters at Salto Palmares. At first I thought of leaving him to his fate, as he had left us; but when he, all in tears, told me that his comrade Antonio was dying in the bushes, I took pity on them, and had them brought on board. Antonio, who formerly was an active and powerfully built man, was so exhausted that he had to be carried on board, and could hardly speak. Julian, though not actually ill, looked like a skeleton. On being interrogated, he explained in "guarani" (Indian) *patois* that their original plan was to pick up the canvas boat which I had had sunk below the fall as useless, but our keen pursuit had frustrated this design. They continued for a while on foot, following the banks of the river; tired of this, they constructed a raft, which, however, capsized, and Antonio, already then ill, was nearly drowned, and their rifles and few

provisions lost. They again started walking, but Antonio, getting worse and worse, finally could not move any more, and had been lying down for four days at the place where we overtook them, waiting for death to relieve him from his sufferings. They had been able to sustain life by some stray birds.

Without further incidents, we reached Las Juntas, where we found the other branch to be very low. Mr. Freund, on his relief expedition, had met with another exploration party, under the command of Captain Page, of the *Argentine*, who had penetrated into the left arm of the Pilcomayo, and from the low state of this river, I presumed that Captain Page might have been caught in the same way as we had been ourselves at Las Penas, especially as his steamer was considerably larger than the *Explorer*.* I therefore resolved to go in search of Captain Page, and to offer my assistance, if necessary. However, after penetrating a few miles, I found the river so low that I had to abandon all hopes of advancing any further. Consequently, we returned to Las Juntas, and continued our downward journey.

Four days later we reached the first settlement close to the mouth of the Pilcomayo, where I was told that three days previously a canoe, with five men belonging to the Page expedition, had passed on their way down in search of provisions. On June 17 we once more dropped anchor in the port of Asuncion, after an absence of 162 days.

We had not been able to reach Bolivia, but I had practically proved my theory, that the Pilcomayo was not navigable. We had penetrated further than any other expedition; had surveyed the course of the river towards 24° S. lat. and had made a series of astronomical and meteorological observations. Among the collections, the botanical was specially rich, containing a number of formerly unknown plants.

On my return to Buenos Aires, I presented to the Minister of War an account of the expedition, accompanied by a map of the river and a report on its hydrological conditions. I will not here enter into the details of my report, but only mention the conclusions I arrived at after a careful investigation into previous explorations of the Pilcomayo, and comparing these with the experience and observations gathered in my own.

1. The Pilcomayo is not navigable for commercial purposes.
2. The western or right branch is the principal river of the two that join at Las Juntas.
3. The Pilcomayo has no regular and periodical rise or fall.
4. It is probable that the Pilcomayo debouches into the Paraguay river by one or more outlets beside the one in front of Lambaré below Asuncion.

THE MONTHLY RECORD.

THE SOCIETY.

Honour to the President.—M. Arthur Claparède, President of the Geographical Society of Geneva, writing to Mr. Markham, informs him that he has been elected an Honorary Member of that Society in place of the late Sir Henry Rawlinson. The number of such members is limited to

* The Page expedition actually was detained some 30 miles above Las Juntas, and did not get back till May, 1891, after an absence of fourteen months, and with the loss of its commander, the doctor, and several men. During the whole of this time the left branch of the Pilcomayo never had a rise of any importance or duration.

thirty. "The Society," M. Claparède, who writes in English, states, "is very pleased to be able to place among its Honorary Members a man who, by his illustrious travels and books, is so well known to the scientific world and to geographers, and who so ably presided over the Sixth International Geographical Congress, held in London last summer."

Educational Lectures.—The second series of ten lectures on "The Principles of Geography," by Mr. H. J. Mackinder, M.A., will begin at Gresham College, Basinghall Street, on Monday, January 13, at 6 p.m., and be continued on succeeding Mondays. The subjects of the lectures will be as follows:—Lecture 11, the Relief of South-East Britain; 12, the Structure of South-East Britain; 13, the Drainage of South-East Britain; 14, South-East Britain before Cultivation; 15, the Successive Entries of Man to South-East Britain—Natural Frontiers; 16, the Metropolis; 17, Roads and Minor Settlements; 18, Territorial Organization; 19, the Part of London in British History; 20, the Part of Britain in the World's History. Each lecture will be followed by a class for more detailed study, and the course will be illustrated with diagrams.

EUROPE.

"University Extension" in Austria: Geography.—Among the "Popular University Courses" which are being held this winter for the first time under the direction of professors, lecturers, and assistants, in the University of Vienna, both geography and its sister science geology are represented. Dr. R. Sieger is dealing with the "Elements of Geography" in a course of six lectures, which were opened by Professor A. Penck in a discourse on the "Beauty of the Earth." A second course of six lectures on "General Geology" is being delivered by Dr. F. Wähner. Lantern illustrations are employed to give additional point to the descriptions of the lecturers, and to render them more generally intelligible. These courses are open to all, with the sole exception of school-children.* In Prague, too, there will be "Popular Courses" during the winter, under the direction of the Professors of the German university in that city, among which one by Dr. Uhlig on "Geology" is included.

The Military Geographical Institute in Vienna.—We learn that Major-General (commanding division) Emil Ritter von Arbter, director of the above institute since November, 1889, has been placed on the retired list at his own request, with special honours. Major-General Christian Ritter von Steeb, formerly Surveyor-General, has been appointed to the vacant directorship.

ASIA.

The Pamir Boundary Commission.—From a brief official report by Colonel Holdich, dated Bandipur, October 12 last, supplemented by an admirable series of letters to the *Pioneer* written by one of the members of the Commission, we glean many noteworthy particulars of the route and geographical work accomplished. The road followed was by way of the Burzil and Darkot passes, the latter of which proved most trying to the native followers, who were blinded and blistered by the burning July sun reflected off the dazzling newly fallen snow. This was the most arduous bit of the journey, the crossing of the Hindu Kush itself being not over the Baroghil, but by a pass "equally easy" a few miles east

* The charge for each course, extending over six evenings, is 50 kreuzer.

of it. From Sarhad to the Pamirs, the track along the Wakhan river was excessively narrow and steep, but was readily traversed by the Kashmir ponies, which proved a decided success as beasts of burden. Here the survey party under Colonels Holdich and Wahab had to fall behind, owing to the rapidity of the march. The long narrow valleys, flanked by ranges resting on bases so broad as to render the peaks invisible from the plains, were excessively difficult to map out, a state of things aggravated by bad weather. From the summit of a grand peak overlooking the Benderski pass, however, Colonel Wahab was enabled later on, during a momentary break in the weather, to fix a complete array of Himalayan peaks to the southward, which contributed effectually towards the satisfactory union of the two systems of triangulation. The main geographical objects of the surveyors were to make a topographical map of the country adjoining the boundary, and to join the two systems of triangulation as mentioned. In the previous Afghan Boundary Commission all difficulty as to a common basis of triangulation had been obviated by the acceptance on the part of the Russian Commissioner of the results obtained beforehand by the British party. In the present instance, the Russian triangulation, which is of first-class rank among geodetic surveys, had already been extended as far as Osh, about 200 miles from Lake Victoria, while on the Indian side triangulation by Colonel Tanner had been projected so as to fix several peaks south of the Hindu Kush and Mustagh ranges. Bases were accordingly measured at Zartigar, north of the Baroghil pass, at Langar Sarhad, and at Chakmaktin, on the borders of the lake which is the source of the Aksu, at an elevation of 13,000 feet above sea-level. In spite of cloudy and squally weather, Colonel Holdich tells us that the connection between the bases was maintained, and plane-tabling was carried on with praiseworthy determination by Khan Sahib Abdul Ghazar. At the first *séance* between the English and Russian surveyors, it was decided to select two points for a final comparison of co-ordinate value (*i.e.* in latitude and longitude, as also in altitude), and these were arranged to be No. 1 Pillar of the Boundary Demarcation at the eastern end of Lake Victoria and the Gumbaz or dome of Kizil Robat, near where the demarcation ends. At the former the greatest difference in the latitude observations occurred, the Russian value being 37° 26′ 10″, and the English, by triangulation, 37° 26′ 30″, or 20″—a difference which Colonel Holdich was unable to account for. At Kizil Robat Gumbaz the difference was only 10″. But as regards longitude the agreement was remarkable, the difference in regard to Pillar 1 being only 4″, and Kizil Robat Gumbaz 6″. Thus, as Colonel Holdich says, "We found ourselves standing on the roof of the world, with practically no differences between us to eliminate and disperse so far as our mapping was concerned."* About forty well-marked points and peaks were fixed by triangulation, which will form an admirable series for a final trigonometrical junction with the Russian system, while about 4800 square miles of topography were sketched on the quarter-inch scale, besides 250 square miles of special survey to illustrate doubtful or disputed points. Unfortunately, Colonel Wahab was unable to obtain a second determination of the great peaks on the Trans-Alai range and the well-known Tagharma mountain, which would have formed a valuable connection with route surveys in Eastern Turkistan; while Colonel Holdich was prevented by Chinese obstructiveness from determining the position of Tashkurgan. Lastly, as regards height observation,

* The values were as follows:—

Pillar No. 1	English	73° 48′ 55″	= + 4.
	Russian	73° 48′ 59″	
Kizil Robat Gumbaz	English	74° 46′ 56″	= + 6
	Russian	74° 47′ 2″	

the trigonometrically determined altitude of Kizil Robat (12,780 feet) was in absolute agreement with the Russian value, while that at Lake Victoria (13,300 feet) only differed by 40 feet. Altogether, the geographical results of this Commission may be pronounced to be of the highest importance, and to reflect no small credit on Colonels Holdich and Wahab and their native assistants, while the extraordinary rapidity of the operations, which were compressed into an aggregate period of four months (two of which were spent in travelling), is an additional point of congratulation, for had luck failed to befriend them in this respect, it would have been impossible to achieve the desired results, political and scientific, within the short working season available in these semi-Arctic regions.

Expedition on the Indian North-East Frontier.—Owing to the hostility of the Sana Kachins, who inhabit the hilly country about the headwaters of the Irrawaddy, between 26° and 27° N. lat., the Indian Government have decided to despatch a small expedition, consisting of about 450 mounted police and two guns, into the Sana country, to inflict chastisement on the Kachins, and exact guarantees for future good behaviour. From a geographical point of view, the move will be very interesting, as it will doubtless throw additional light on the sources of the Irrawaddy, which are still unknown. Our extreme post in that direction is Myitkhina, and, owing to the difficulty of the country, the deficiency of supplies, and the refractory character of the mountaineers, it has been found impracticable to penetrate much more than 50 miles north of that station, and to make a thorough examination of the two main head-streams, into which the Irrawaddy divides about 25° N. lat. Indeed, there has been no practical advance beyond the geographical standpoint attained by Colonel Sandeman's native explorer in 1879. The Sana section of the Kachins inhabit the tract lying between the Mali-Kha, or western river, and the hills separating its valley from that of the Hukong, which lies nearer to the Assam frontier. It is intended that a survey party with an escort shall reconnoitre the passes across this intervening range, with the object of opening up the Hukong valley, which is fertile and productive of the *Ficus elastica*, or rubber tree. With the development of these regions, it might become feasible then to carry into effect the long-deferred and much-needed connection between the Assam railway at Makum and the Burmese system at Mogaung, and thus join the basins of the Brahmaputra and Irrawaddy. From Mogaung to Myitkhina the line has been already sanctioned, and, in spite of the difficulty of the intervening region to the north-east, it is anticipated that much of the Yunan trade will be attracted by this route.

Prince Henry of Orleans in Indo-China.—A letter from Prince Henry of Orleans, dated Tali-fu, June 1, 1895, has been received by the Paris Geographical Society (*Bulletin*, 1895, p. 388), in which the traveller gives an account of the successful completion of the first stage of his new journey, viz. that from Tonkin to Yunnan. The object of the prince was as far as possible to avoid the main routes, and travel by paths hitherto untraversed by Europeans, and in this he seems to have succeeded to a large extent. Accompanied by MM. Roux and Briffaud, and with twenty-seven baggage animals, he set out from Manhao, on the upper Song-ka, on March 1, and explored the country on the right or southern bank of that stream, having heard of a mule-path to Yuen-chiang in that direction. The country passed through was very rough, involving constant ascents and descents of steep slopes by slippery paths. Before reaching Yuen-chiang (which town was passed both by Garnier and Colquhoun), the prince struck south-westwards in order to reach Ssemao by a new route, which was reported to be used by the tea-caravans coming *viâ* Muong-li. The population was for the most part non-Chinese, consisting of Hu-Niis, Taos, Lolos, and Païs, who generally accorded the party a peaceful reception,

although at one village, whose people mistook them for brigands, hostilities were for a time threatened. The country was as broken as that near the Song-ka, and the route led across the Li-san-Kiang or black river, as well as an important tributary. The Mekong watershed was crossed at an elevation of 4300 feet by an easy pass, before the great plain of Ssemao was reached. Two Englishmen were reported to have lately passed through the town, having come from Burma to Tali-fu by Teng-Yueh, and returned by Yun-chu and Ssemao. From the latter town Prince Henry proceeded westward to the Mekong at Nocha-Tiampi, the second crossing-place northwards of Khieng-hung. A colony of Païs exactly resembling the Laotians, surrounded by populations who have adopted the Chinese dress and customs, was passed *en route*. From Tiampi, where the river had a breadth of 120 to 160 yards, with wooded banks of moderate steepness, the expedition turned northwards, keeping for the most part within the valley of the Mekong, though at one point the crest of the ridge separating it from the Salwin was crossed. In this latitude the basin of the Mekong seems to have a very small width, the whole of which can be crossed in eight hours. The whole route was through a mountainous country. Altogether the river was touched at six different points, the observations taken at which will supply the basis for the mapping of this little-known part of its course. The representations of previous travellers as to the unhealthiness and dangerous character of this portion of the valley seem not borne out, a frequented route leading along it from south to north, from the Laos country to Tali-fu. The latter place was reached on May 26, the Mekong having been finally crossed by a chain bridge near Shunning-fu, north of Yun-chu. Besides the topographical survey, investigations were made into the natural history, commerce, and ethnology of the regions traversed, and twenty-two Lolo manuscripts were obtained, two being in part translated into Chinese. The following telegram has been received from Prince Henry: "At the end of August we completed the exploration of the Chinese Mekong. From September to December we have gone on foot through the independent country of Tibet, crossing all the branches of the Irawadi near its source, and have arrived in Assam. Since our departure from Tongking we have travelled 2000 miles, 1500 having been previously untrodden. We have made numerous collections, and hope to arrive in France in the middle of February."

The Tibet Expedition of Captain Roborovsky.—The following telegram, dated Zaisan, December 4, has been received by the Russian Geographica Society from Captain Roborovsky, chief of the Tibet expedition, announcing his return to Russia: "On December 3 the expedition reached Zaisan. Kozloff went from Lyukchun, *viâ* Girchen and Jungaria, to Urungu and Zaisan. I came with our caravan, heavily laden with collections, *viâ* Urumchi and Mienas, through waterless Jungaria, on a new route to Kabuk-Zaisan. All in good health. The expedition has covered altogether over 16,000 versts (10,700 miles), and made a survey all along. Thirty points have been determined by astronomical observations; meteorological observations and hypsometrical measurements made all the time; fauna and flora explored; many photographs. The natural history collection contains 250 mammals, 30 skins of mammals, 1300 skeletons of birds, 450 amphibia and fishes, 30,000 insects; herbarium contains 25,000 specimens of about 1300 species, 300 specimens of wild and cultured seeds; 350 geological specimens. A great variety of ethnographical, military, and other observations. The meteorological station at Lyukchun has been at work for two years. As soon as the expedition is broken up, we come to St. Petersburg."

Expeditions in Siberia.—We learn from *Petermanns Mitteilungen* (1895, No. 8) that an expedition under the command of Lieut.-General Petroff has been

set on foot, for the purpose, in the first instance, of furthering the progress of the Siberian railway, but with the additional object of studying the question of the general opening up of the country through which it passes. Its attention will be directed to the waterways, and the possibility of opening them to navigation, and also to the mineral resources and supplies of wood, particularly in connection with the fuel requirements of the railway. M. Obrucheff has also been entrusted with a commission to explore the mineral wealth of Transbaikalia, particularly the district of the river Onon.

New Attempt to reach Lhasa.—It is stated that an attempt to reach Lhasa is being made by Dr. P. Moewis, who with this object has professed his conversion to Buddhism, and adopted the habit of a lama at Darjiling (*Pet. Mitt.*, 1895, No. 8).

AFRICA.

Miss Kingsley's Travels in West Africa.—Miss Kingsley has kindly sent, at short notice, the following notes on her recent journeys in West Africa: "I was in Calabar from January until the end of April, 1895, owing to the kindness of Sir Claude Macdonald and Lady Macdonald. I was able to do some work among the fishes and insects there, and obtained an addition to the knowledge of my favourite subject, fetish, that is of immense use to me. My aim in going out this time was to get together a general collection of fish from a West African river north of the Congo; for the terrific current of that river, I found on my previous journey in 1893, makes a tremendous impression on distribution. I also found that an equally interesting difference in the species of religion existed between Calabar and Cameroons, where you cross the border-line between the true negro and the Bantu races; so I, on leaving Calabar, went down to Congo Française, where I knew, from previous experience in Kacongo, that the influence of my friend Mr. C. G. Hudson would be of great service to me. It was; and I started fishing in the Ogowe, pottering up that beautiful river to above the Alemba rapid. I then made my way down the Rembo Ungo into the Karkola river, from thence into Lake N'Kovi, and then overland through Efuma, Ejaga, and Esun, etc., and came out on the Rembwe at N'dorko, making my way up to Agonjo. From Agonjo I came down the estuary of the Rembwe and Komo to Glass, where, knowing my wandering through the country of the Fans would not be approved of, I endeavoured to persuade Mr. Hudson that I had done so from scientific motives. 'No, Miss Kingsley,' he said; 'you fell into the hands of those wretched Fans, and they took you touring about their country like a circus show,' etc. I am bound to say there is much truth in his statement. At the end of September, in the tornado season, I reached Victoria per s.s. *Niger*, owing to the kindness of the Governor of Cameroons, Herr von Puttkamer, and of the Vice-Governor, Herr von Luke. I was enabled to get more fetish information, and ascend Munyo ma Lobe; and when I had done these things, as Julius Cæsar would say, they sent me round in His Imperial Majesty's ship *Nachtigal* to Calabar, and from Calabar I came home in one of my old friends the British and African Company's steamboats. The Ogowe, which is pre-eminently the river of the equator, is more of the nature of the Congo than of the Niger Delta rivers, save that, unlike the Congo, it has an immense delta. This delta commences at Lambarene, 130 miles from the sea, and just below the entrance of the Nguni. This delta region is tremendously interesting, both in its flora, fauna, and fetish. It is called Kama country. Its main population is made up of malaria microbes and mosquitoes, and it is supremely damp; indeed, the whole of it, save the strange bubble-shaped hills you find in it, is under water from Lambarene to the sea, where the Ogowe comes down in the 'long wet'—the

two great lakes in the Lambarene district, Lake Azingo, and the larger Lake of Islands, and all the string of lakes along the Rembo Ungo. overflowing into the forest. I hope to embody my knowledge of this region, chiefly a knowledge of the north side of the delta, in a chart. I will now only say that the long slope of the land between the Ogowe and the Rembwe is towards the Ogowe and Lake Azingo, the short slope is towards the Rembwe, where the spur hills of the Sierra del Crystal range end suddenly in mangrove swamps. The mangrove line is far higher up on the Rembwe side than up the Ogowe, because the broad estuary of the Gabun, into which the Rembwe and the Komo fall, brings the salt tide water further inland, and because the current of the Ogowe is, like that of the lower Congo, exceedingly swift and strong, and the body of fresh water poured out by it immensely larger than the conjoint supply emptied by the Rembwe and Komo into the Gabun. There is one point that puzzled me about the Ogowe, which no doubt learned people can easily explain, and that is, that this river commences to rise, in the 250 miles of the river that I know, a month before the rains begin. The rise of the Ogowe in the long wet is 18 to 20 feet in Talagouga narrows; in the short wet it is from 12 to 15 feet. In regard to the peak of Cameroons, I should like to say I was the twenty-eighth European who succeeded in ascending it; the second to ascend it from the south-east face, the usual route being by the sea face from Babundi. My motive in taking the other way was to get a view of the Rumbi and Omon mountains, a range—for they are, geographically speaking, one and the same—totally distinct from the great Cameroons, whose relations are Clarence peak, Fernando Po, St. Thome, and Anno Bom,—mushrooms, as regards age, to the Rumbi and Sierra del Crystal. The first party to ascend the peak of Cameroons from the south-east side was the first lieutenant and the doctor of His Imperial Majesty's ship *Hyæna*, and I owe much to the information they gave me when I had the honour of meeting them at Victoria. I wish to acknowledge in this far-reaching *Journal* my deep sense of indebtedness to the French and German officials; and when I think of the magnificent opportunities afforded me, both in Congo Française and Cameroons, and the safety that their practical help and prestige enabled me to enjoy, I am ashamed at not having done more in matters that would interest geographers, but I am only a lady pottering about after fetish and fishes. The administration of Congo Française filled me with admiration. France is singularly fortunate in having for governor of this colony the greatest of the West African explorers, M. de Brazza; but he is most splendidly seconded by his subordinates, who 'go for bush' with a hand-valise in a way, I grieve to say, the English on the coast do not. Indeed, were it not for the Royal Niger Company, who have done, and are doing, a magnificent work, of which every Englishman should be proud, our position, as regards exploration, etc., on the coast, would be a very despicable one; for where, outside the Niger Company, can you find men worthy to be named in the same breath with De Brazza and Dr. Zintgraff? The present trade value of our west coast possessions to us is over £3,500,000 a year. It will not be that long if we do not possess ourselves of the command of the interior trade routes. The whole of the Niger delta coast is structurally incapable of being self-supporting, and we shall some day, if we persist in 'living for beach,' find ourselves cut off from the interior trade supply all along the line. Sierra Leone is already ruined. Our chance is still open to us behind the Gold Coast, in the Niger delta, but it will not stay open long."

Dr. Gruner's Expedition in the Niger Basin.—A fuller account of Dr. Gruner's expedition than that previously published (*Journal*, vol. vi. p. 184) has been communicated to us by Dr. von Danckelman. Misahöhe, of which station Dr. Gruner had for two years been chief, having been left on November 5,

1894, Salaga was reached on December 2. A civil war, consequent on the death of the last sultan, had laid waste the whole country round; and the town itself had been reduced to a village of scarcely a hundred huts. The Dagomba territory, of which Yendi is the capital, is fairly well peopled, has large farms, and is rich in cattle. It is ruled despotically by a sultan, who has acquired a considerable influence in these regions. Sansanne Mangu, further to the north-east, is of less importance, though governed in the same way. The route hence led by way of Pama, Machakuale, and Kankanchari, then the residence of the king of Gurma. Lieut. von Carnap had been sent on here in advance; but the whole expedition again united and set out for Say on the Niger, traversing a completely waste and desolate region. The river, although low at the time, has an average breadth at that place of 900 yards. At Kirotashi Dr. Döring, who had remained behind at Boti, again joined the expedition on February 22, having proceeded thither by land. Whilst the main body now journeyed down the stream on the right bank, Dr. Gruner proceeded in a canoe, in order to take an accurate geographical survey of the stream. At Bikin small-pox broke out among the porters, and the town of Girri was only reached after heavy losses on March 20. On the 23rd Lieut. von Carnap started down the stream with the sick, for Bussa and Lokoja, where he received friendly aid from the officials of the Royal Niger Company. Drs. Gruner and Döring started on the same day with 56 men in a north-easterly direction for Gando, arriving on April 2. The return was made by Ilo and Kuande to Sansanne Mangu, which was reached on May 4; and on July 4 the leaders of the expedition were already sailing for Europe from Little Popo. Dr. Gruner's careful astronomical observations, for which he was particularly well-equipped, promise to supply important corrections in the map of the Western Sudan.

Captain Toutée's Expedition on the Niger.—Captain Toutée has returned to France, and on December 6 gave an account of his mission (cf. *Journal*, vol. vi. pp. 185, 386) before the Paris Geographical Society. A short outline has been published in *La Politique Coloniale* (Dec. 10). The march from Kotonu to the Niger was accomplished with little difficulty, apart from a temporary misunderstanding with the Baribas. After remaining five weeks (partly occupied in the establishment of a fortified post*) on the right bank of the Niger, the French traveller started up the river on March 25, 1895,† and reached Bussa at the head of the rapids after sixteen days' efforts. Above this point the river was quite free from rocks or rapids. In thirty days Say was reached, and eight days later, the southern limit of the desert was passed. Here the expedition narrowly escaped annihilation at the hands of the Lumatu Tuareg, who laid an ambush, but were finally repulsed, after which Captain Toutée passed the large town of Zinder, and on June 12 arrived at Tibi Farsa, whose inhabitants were subject to the commandant of Timbuktu. On the descent of the stream the Tuareg had again to be encountered, and at Kompa (Gomba) the town was found besieged by Ahmadu and Ali Bomi, two implacable enemies of the French, who were defeated, and the latter slain. The rapids below Bussa formed a much greater obstacle in the descent, the water being low, and were only passed after fourteen shipwrecks. Captain Toutée, however, finally reached the sea in the same craft in which he had started on his exploration of the river.

The Timbuktu Region.—We have already referred (vol. v. pp. 273, 384) to

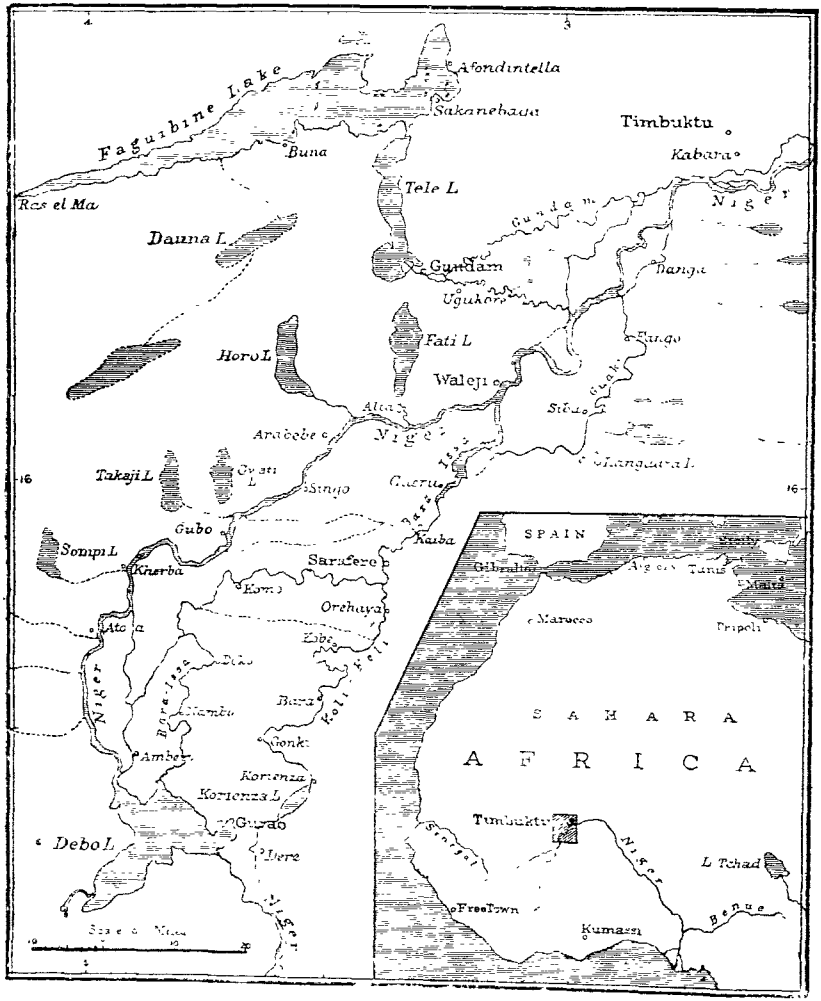
* Since abandoned, according to the latest accounts.

† Both Decoeur and Gruner had traversed the section of the river between Say and Gomba between February 1 and March 20.

the results of French surveys and investigations in the district round Timbuktu, and to the sketch-map published by the Paris Geographical Society, showing the recently explored lakes connecting with the Niger. Lieut. Bluzet has since contributed to the *Bulletin* of the same society (1895, part 3; also reprinted as a separate pamphlet) a general sketch of the Timbuktu region, accompanied by a

THE UPPER NIGER REGION.

Reduced from a Map by Lieuts Hurst and Bluzet.



detailed map on a large scale (1 : 500,000) showing the results of all the recent explorations. Lake Debo, traversed by two branches of the Niger (from which point the writer considers the region in question to begin), is a deep lake with a clean sandy beach to the east, although its influents traverse a swamp region, intersected by channels, to the south. North of the lake the whole country for some distance from the main stream is liable to inundation at high water, while at low

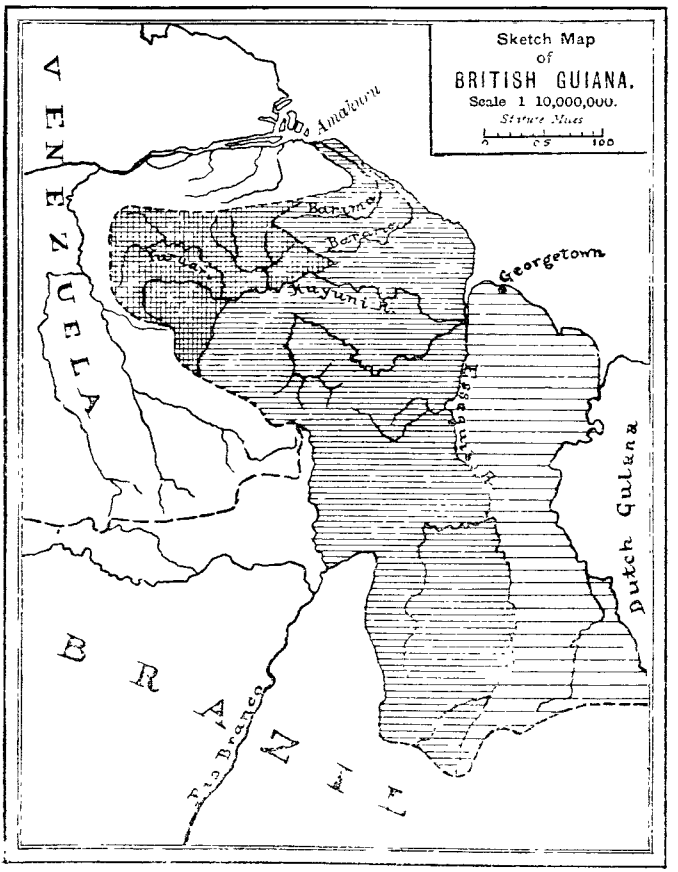
water a series of lakes is left behind, connected by reedy channels with the Niger. Nearer Timbuktu these lakes have better-defined shores, bounded in many places by lines of hills. In particular, the large lake of Faquibine, joined by a narrow channel to that of Tele, north of Gundam, is shut in on the north and east by mountains, and attains a depth of 100 feet. Though very narrow towards the west, its length is no less than 68 miles. Numerous islands afford good shelter from the storms to which the lake is liable. The Gundam channel, which connects Lake Tele with the Niger, flows into or out of the lake according to the season. The whole plain in the direction of Timbuktu is annually inundated (high water occurring during the local dry season), and forms an admirable rice-field. Kabara, the port of Timbuktu, is situated at the margin of the flooded lands, and is connected with that city at high water by a winding channel, navigable for boats carrying a hundred tons during two months of the year. The seasons are not so well marked as in other parts of the Sudan. December and January are the best months, and April and May the worst; but, owing to the general dryness and the cool nights, the climate may be said to be comparatively healthy. The situation of Timbuktu renders it the natural point of exchange between the products of the north and south, the former including European goods (principally German and English stuffs) from Mogador, as well as salt (the staple product of the desert), hides, sugar, tea, etc.; while honey, wax, *Karite* butter, etc., come from the south. Besides rice, cotton and other produce thrive well, and large numbers of sheep and cattle are reared in the neighbourhood. Since the French occupation, a revival of trade is said to have set in.

Captain Bottego's New Expedition.—Captain Bottego has again set out for Somaliland, in order to supplement his former work and that of Prince Ruspoli by new explorations (*Pet. Mitt.*, 1895, No. 9). Accompanied by Lieut. Vannutelli and Dr. M. Sacchi, he has this time made Brava his starting-point for the interior, and hopes, after founding a station at Lugh, to reach the Omo by way of the upper Jub, and to finally settle the question of its termination.

AMERICA.

The British Guiana and Venezuelan Boundary Frontier.—Mr. G. G. Dixon sends the following note: "The accompanying map will give an idea of the position of the three boundary-lines which are now in dispute between Great Britain and Venezuela. The eastern portion crossed by open lines is not in dispute. The lightly shaded portion indicates Venezuela's extreme claims to territorial right. The cross-shaded portion indicates the extreme claims of Great Britain, which include the whole of the drainage area of the Essequibo river, with its tributaries, the Mazarina and Kuyuni rivers, also the Barama and Barima rivers, with their tributaries, and the land up to the right bank of the Amakuru river. Great Britain claims this as having received the territory in cession from the Dutch, who had farms and plantations on their banks. The line laid down by Sir R. Schomburgk commences at the mouth of Amakuru river, which it follows to its source, continuing round the head of the Barima and Barama rivers, to the source of the Akaribisi creek, which it follows to its junction with the Kuyuni river, then continuing up the Kuyuni to its source in Roraima mountain. The British Government are willing to go to arbitration on the territory west of the Schomburgk line, but do not recognize that Venezuela has any claim to any land east of the line. It was at the junction of the Yuruan river with the Kuyuni river that the Yuruan incident took place. The British Yuruan frontier station is situated

immediately opposite the junction of the rivers, on the right bank of the Kuyuni."



Reference should be made to the paper and accompanying maps by Mr. Dixon in the *Journal* for April, 1895.

Title to British Guiana.—The President, Mr. Clements R. Markham, C.B., contributes the following note on this subject. Although we have nothing to do with the purely political aspect of the subject here, it is interesting to note how far the British claims are based on geographical discovery. "The claims of Great Britain to the basins of the Essequibo, Demerara, and Berbice, forming British Guiana, consist of treaty right, right of discovery, and right of occupation. By the treaty of 1814 Holland transferred to Great Britain all her rights in what then became British Guiana. Spain, then in full possession of Venezuela, was a party to the treaty of 1814. Spain, therefore, recognized the rights of Great Britain, and by that act cancelled any claims she may formerly have made, based on the Bull of Pope Alexander. Those claims, absurd as they were, have not, therefore, been inherited by Venezuela. The right by occupation, inherited by Great Britain from the Dutch, dates back for upwards of three centuries. It is as old as the settlement of any part of the United States: and it has been continuous, on both banks of the Essequibo. The portions of

British Guiana which had not been occupied belong to Great Britain by right of discovery, and that right was established through the initiative of the Royal Geographical Society. Our Council resolved to prosecute those discoveries in the year 1834. With this object the Council selected an accomplished young Prussian traveller named Robert H. Schomburgk, whose ability had been brought to their notice by a valuable paper on Anegada, published in the second volume of our *Transactions*. The Council paid his expenses, advancing £900 in 1835, and drew up his instructions, which were to investigate the physical and astronomical geography of the interior of British Guiana, and to connect the positions thus ascertained with those of Humboldt on the Upper Orinoco. Schomburgk left George Town in September, 1835. In the following four years he explored the Essequibo to its source, the Berbice, the Rupununi, the Kuyuni, the Barima, and other rivers. He traversed vast tracts never before pressed by foot of white man. He discovered the great falls of the Essequibo, and named them after King William IV. as the patron of our Society; and he named the Murray falls after our President. He also established all the points at which Dutch posts had ever been formed. In 1840 Sir Robert Schomburgk received the gold medal of our Society, and in 1848 he edited Sir Walter Raleigh's 'Guiana' for the Hakluyt Society. In 1841 Sir Robert Schomburgk was appointed Her Majesty's Commissioner to survey the boundaries of Guiana. He drew a line across the basin to include the territory belonging to Great Britain by the rights of treaty and of occupancy. All beyond the line, and within the basin, belongs to Great Britain by the rights of treaty and of discovery. But by this time the Venezuelans had put forward a claim based on Pope Alexander's Bull. Great Britain has been anxious to make large concessions of her indubitable rights, for the sake of satisfying her neighbour; but her offers have not been met in a similar spirit. The title of Great Britain to British Guiana must be held to be impregnable by every impartial inquirer. It must be a source of great satisfaction to the Fellows that one part of the title, namely, the right conferred by discovery, is due entirely to the initiative taken by our Society, and to exploration undertaken at the Society's expense, and under the instructions of our Council."

Exploration of the Rio Puelo, Chile.—The Rio Puelo enters the east side of the Boca de Reloncavi in 41° 40′ S. It was explored in 1872 by Captain Vidal Gormaz up to the head of its navigation, about 23 miles in a direct line from its mouth; and now its valley has been ascended to its head by Dr. Hans Steffen and Dr. Krüger, in pursuance of their explorations in fixing the Chilian-Argentine frontier. Dr. Steffen has contributed an account of their journey, accompanied by a map on the scale of 1: 1,000,000, to *Pet. Mitt.*, 1895, No. viii. Above the point indicated he found the river to be everywhere unnavigable, mostly tearing along a series of rapids and cascades at the bottom of a deep chasm. The journey was accordingly mainly by land—the first part through a wooded plain, the second part through the remains of a forest destroyed by fire. About 60 miles in a direct line south-east of its mouth, the river was found to issue from the lower of two lakes connected by a series of violent rapids. These lakes Dr. Steffen named Lago Inferior and Lago Superior; the latter, the larger, very irregular in shape, measuring about 6½ miles in length, with an average breadth of 2½ miles, exclusive of an arm stretching to the west in the direction of the Lago Inferior. A broad longitudinal valley, containing excellent pastures, opens on the north end of Lago Superior, and here the explorers found a Chilstan colony, established two years previously. The members had found their way there by Lago Nahuel-huapi. The trade relations of the colony are at present with the Argentine government of Chubut, with which communications are maintained by a pass to the north-east,

which, being found to be the water-parting between the east and west slopes of the Andes, formed the goal of the present journey.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

North Atlantic Bottle-Voyage.—The Hydrographer of the United States Navy, Commander Sigsbee, has forwarded to us a paper which had reached him, accompanied by the following note: "Island of Flores, October 10, 1895. Dear Sir,—The enclosed paper was found near this shore of Santa Cruz on the 4th inst. As requested, please forward it on to London. Yours very respectfully (Signed) JAMES MACKAY." The enclosed is a half-sheet of blue paper a good deal bleached by sea-water, the lower part, including presumably the signature, being torn away. As far as legible, it runs as follows: "S.S. *Huntcliffe*, of West Hartlepool, 10.30 a.m., March 3, 1895. In lat. 24° 8′ N., long. 82° 11′ W. this was dropped over in a bottle. If ever picked up kindly inform Geographical Society, London; but do not incur any expense, as, all being well with weather fine and sea smooth, there is not any need to particularly notice this [paper?], as the master is merely . . . to make the light on South Key, after which he will steer for a . . ." The remaining six lines are unintelligible, owing to the action of the water; but they do not seem, judging from the few words which appear, to add anything to the information given above. We have ascertained from the owners, Messrs. Horsley and Son, of Hartlepool, that the *Huntcliffe* passed through the strait of Florida on the night of March 3, bound from Mobile for Liverpool. The bottle, having been recovered on October 4, had not been more than seven months or 214 days in the water. The shortest distance between the Strait of Florida and Flores is 2580 nautical miles, giving a minimum speed of 12 nautical miles or 14 statute miles per twenty-four hours. The bottle could not have taken the shortest route for Flores, as it would in that case have gone ashore at Bermuda, and it is unlikely that it was discovered on the day it reached the Azores. Supposing it had travelled in a curve along the southern edge of the Gulf Stream, the distance would approximate to 3000 miles, and the speed be about 15 nautical miles in twenty-four hours. This drift fully confirms the views formed from existing evidence as to the relatively high velocity of the west-flowing current in the western half of the North Atlantic Ocean.

GENERAL.

Death of Otto E. Ehlers.—This enterprising German traveller, whose death by drowning while crossing a river in German New Guinea has lately been announced, first became known to geographers by his attempted ascent of Kilimanjaro in 1888. His original claim to have reached a point over 19,000 feet above the sea evoked a lively controversy, and he himself subsequently admitted that he had been mistaken in his estimate. In 1890, after carrying the presents from the German emperor to Mandara, chief of Moshi, with which he had been intrusted, he attempted to penetrate to Lake Manyára, without, however, advancing beyond Arusha. Arriving in India in July of the same year, he made his way from Kashmir to Assam along the southern edge of the Himalayas, and, having visited Manipur, accompanied the troops who had taken part in the Manipur expedition to Mandalay. His plan of a journey through the Shan States and Siam was for a time delayed by the unfavourable time of year, the interval being spent in a visit to the Andamans, Nicobars, and Ceylon. Starting finally from Maulmein, he succeeded in crossing the Indo-Chinese peninsula to Tongking, *viâ* the Shan States, and gave an account of his journey in his book, 'Im Sattel durch Indo-China,' published in 1894. Herr Ehlers laid no claim to the character of a scientific traveller, his wanderings being rather prompted by a roving disposition

and love of adventure, but his writings contain some readable sketches of the varied incidents of travel, and of the life and manners of the races with whom he came in contact.

Vasco da Gama Celebration in Portugal.—We have received from the Geographical Society of Lisbon, which has been foremost in the promotion of the idea, official intimation that in 1897 a grand celebration of the fourth centenary of the voyage of Vasco da Gama to the East Indies will be held throughout all Portugal, and especially in Lisbon, under the auspices of the state. In view of the vast importance of that voyage for the whole history of modern civilization, it is hoped that this celebration will partake as far as possible of an international character, and the co-operation of all civilized states, and particularly of scientific bodies and individuals engaged in the study of geography, is earnestly invited by the promoters. It is hardly necessary to add that our cordial wishes for the success of the undertaking are given to the Portuguese nation.

The Tyneside Geographical Society.—The membership of this society is announced in the last annual report as 1054. A new branch of the society has been established at Tynemouth (North Shields), the branches already in existence at South Shields and Durham having proved very successful. The society is thus exercising an influence over a considerable area of the north-east of England, and the branches extend its advantages to many people interested in geography who are unable to attend the general meetings in Newcastle.

OBITUARY.

Henry Seebohm, F.L.S., F.Z.S.

By HOWARD SAUNDERS, F.L.S., F.Z.S.

To the deep regret of his numerous friends and acquaintances, Mr. Henry Seebohm, one of the secretaries of this Society, succumbed to the results of an attack of influenza on the 26th of last November. He was the younger brother of Mr. Frederick Seebohm, of Hitchin, author of 'Lives of the Oxford Reformers,' 'Village Communities,' etc., and was descended from a family which, though associated with Germany for about two centuries, was of Swedish origin. Born at Bradford in 1832, Henry Seebohm displayed from his boyhood a strong taste for natural history, and to this he subsequently devoted all the time that could be spared from business. Ornithology was his favourite branch, and, like many other ornithologists, he began by collecting birds' eggs. It was not, however, till about 1872 that he could indulge in any long excursion abroad; his first expedition being to Greece and Asia Minor, where he had the good fortune to secure the aid and companionship of Dr. Theodor Krüper, the veteran explorer of the Cyclades. In the summer of 1874 Seebohm collected in Northern Norway, where his guide was Dr. R. Collett, of Christiania. The same year Mr. J. A. Harvie-Brown returned from a successful trip to Archangel and the Lower Dwina, bringing information respecting the land still further east, indicating the strong probability that *there* might be found the almost or quite unknown breeding-haunts of some of the waders, such as the grey plover, little stint, curlew-sandpiper, knot, and sanderling. So the early spring of 1875 saw Harvie-Brown and Seebohm sledging on their way to the Petchora, in North-eastern Russia, and, on the *tundras* at the mouth of that river, they succeeded in obtaining—and in practically introducing to ornithologists—the eggs of the two former species. These were figured in the 'Ibis,' in which the scientific results

of the expedition were published; while the full account of the trip appeared in a pleasantly written volume to which Seebohm gave the somewhat paradoxical title of 'Siberia in Europe.' Before this work appeared, however, Seebohm had joined Captain Wiggins, who was going to join his ship, the *Thames*, on the great river Yenesei, before the frost of 1877 broke up; and the account of this really adventurous journey by land, the descent of the river, the wreck of the *Thames*, and numberless interesting experiences were vividly described in 'Siberia in Asia.' Here again, the scientific results, given in the 'Ibis,' were very satisfactory, though they appealed rather less to the public than did those of the former work, for the line of the Yenesei lies to the east of the meridian of Calcutta, and is rather far away for the limited views of the British ornithologist. On his return, Seebohm gave an account of the above journey at an evening meeting of this Society, and many who read this notice will remember the admirable way in which he brought forward the salient features of his expedition, without a moment's hesitation or even a pause to consult a note.

Meanwhile Seebohm had paid a visit to that wonderful little island of Heligoland, which Mr. Heinrich Gätke has immortalized, and the account of bird migration as there observed forms—though unconnected—one of the most interesting chapters of 'Siberia in Europe.' Henceforward Seebohm paid considerable attention to migration, and even passed a winter in South Africa on purpose to acquire information on the subject. He also devoted himself specially to the ornithology and geography of Eastern Asia, on which he became an acknowledged authority. Meanwhile, in addition to numerous papers, he produced (in 1881) vol. v. of the 'Catalogue of Birds in the British Museum,' treating of the thrushes and warblers (*Turdidæ*), on which he was a recognized expert. In 1883 he began, and in 1885 he finished, his best-known work, 'A History of British Birds, with Coloured Illustrations of their Eggs,' in three vols. of text and one of plates; while, following the visit to Africa already mentioned, came the important quarto, 'The Geographical Distribution of Plovers, Sandpipers, and Snipes.' Notwithstanding all these subjects, the Eastern Palæarctic region was never lost sight of, and in 1890 appeared 'The Birds of the Japanese Empire.' In the same year was published 'The Classification of Birds: an Attempt to Diagnose the Subclasses, Orders, Suborders, and some of the Families of Existing Birds'—a work which received a very necessary supplement in 1895. In fact, during the last ten years Seebohm worked with almost feverish energy, and the list of his contributions would fill several pages. He employed collectors in various parts of the world; he bought up celebrated collections and presented them to the British (Natural History) Museum, and whenever ornithological science languished for want of funds, his purse was always open.

Up to last spring he was working with his accustomed energy at an important illustrated 'Monograph of the Thrushes;' but then an attack of influenza, followed by congestion of the lungs, weakened his wiry constitution, and, although he pluckily attended to his duties as secretary to this Society, as he had done for the last five years, and even took an active part in the International Geographical Congress, it was clear to his friends that his health was broken. His presence will be greatly missed here, as well as at the meetings of the Zoological Society, the Linnæan Society, and the British Ornithologists' Club—at the latter of which he was a constant attendant. Consistently with his liberality during his life, the remainder of his magnificent collection of birds and eggs is bequeathed to the Natural History Museum.

CORRESPONDENCE.

Payer's Map of Franz Josef Land.

WITH reference to the remarks in Mr. Montefiore's paper on the Jackson-Harmsworth Expedition in the December number of the *Geographical Journal*, I have distinctly mentioned in the account of my voyage that my map of Franz Josef Land cannot be depended upon. How can any one construct a reliable map of an extensive country if there is only an opportunity to cross it in one direction? Take, for example, the kingdom of Bohemia, and traverse it from Budweis to Bodenbach; nobody would be able to produce anything else than a tolerably reliable route-map. If more details of the country are desired, the prominent mountains require to be ascended, although any map of the surrounding country made in this way is a mere sketch; it is not surveying.

It may seem advisable to leave out all guesswork of the features of a country; but it does not seem to me desirable to recommend the discontinuance of this practice, as in that case much of what is seen would also require to be left out.

The first sketch-maps of Arctic lands are always less reliable; those who come later are expected to improve them.

JULIUS VON PAYER.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1895-96.

Second Ordinary Meeting, November 25, 1895.—CLEMENTS R. MARKHAM, ESQ., C.B., F.R.S., President, in the Chair.

ELECTIONS.—*George Robert Andrews; Francis Henry Ashhurst; Edwin Swift Balch, B.A. (President Geographical Club, Philadelphia); Claude L. Barrow; Captain A. E. Bell; Samuel Lawson Booth, J.P.; John Frederick Briscoe; Edmund Broderip, J.P.; Captain J. F. Browne, R.A.; Henry G. Bryant, M.A., LL.B.; Lieut. James Montague Burn, R.E.; Count J. de Bylandt; Right Hon. Joseph Chamberlain, M.P.; Rev. Stuart Churchill, M.A.; Captain Percy L. Cox (Indian Staff Corps); J. H. Davidson-Houston (4th Royal Inniskilling Fusiliers); Henry James Deacon; Captain C. Delmé-Radcliffe; Maxwell Earle (Grenadier Guards); Major W. T. E. Fosbery; M. F. A. Fraser; Francis Gaskell, M.A.; Right Hon. Geo. Joachim Goschen, M.P.; Rev. H. H. Gowen; Æneas Gunn; Frederick Spencer Guy; Lieut. A. S. Hamilton; Francis R. Hart; Frederick Mitchell Hodyson; James Huddart; Charles Hare Hutchison; Francis Robert Johnson; Georges Jean Lahovary; Alexander Lang; Commander George Loy Langborne; Lieut. G. B. Macaulay, R.E.; Arthur David McCormick; Kaid Henry Aubrey de Vere Maclean; Rev. W. E. McFarlane; Rev. Septimus Martin, M.A., LL.D.; Ernest William Gurney Masterman; Lieut. Mauring; P. J. Miles; Sydney Percival Mitchelson; Captain Redmond George Sylverius Moriarty (Royal Irish Regiment); Thomas Frank Morkham; Graham Smith Nicholson; Reginald Nicholson, M.A.; Robert Palmer-Thomas; Edgar Lecky Phelps; Rev. Thomas Parry Richards, M.A.; Right Rev. Wm. M. Richardson (Bishop of Zanzibar); James Robinson; Hon. Gilbert Rollo; John Ross; E. M. Royds; Max Schoeps; Colonel Henry H. Settle, R.E.; George Simpson; Gerard Philip Torrens; William Waters Van Ness; Lieut. Frederick W. Vibert, R.N.R.; Thomas Ward; Walter A. Whittle; E. Williams; Captain Gustaf Von Zweibergh.*

The Paper read was:—

"The Færoe Islands." By Dr. Karl Grossmann.

Third Ordinary Meeting, December 9, 1895.—CLEMENTS R. MARKHAM, ESQ., C.B., F.R.S., President, in the Chair.

ELECTIONS.—*Edward Benest Shaw Benest; Rev. Frank Besant, M.A.; Count Richard Coudenhove; Charles Herbert Hutt; David Durell; William S. Main; Byres Moir, M.D.; Lieut. Eldred C. Pottinger, R.A.; Ake Sjogren; Joseph H. Stanley; Ferdinand Francis Zehetmayr.*

The Paper read was:—

"Exploration in the Central Alps of Japan." By the Rev. Walter Weston.

Afternoon Technical Meeting, Thursday, December 12, 1895.—W. T. BLANFORD, ESQ., LL.D., etc., Vice-President, in the Chair.

The Paper read was:—

"The Struggle for Life in the North Polar Region." By A. Trevor-Battye.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., *Librarian*, R.G.S.

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce, Commercial.
C. R. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
J. = Journal.
M. = Mitteilungen.
Mag. = Magazine.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue, Revista
S. = Society, Société, Selskab
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

EUROPE.

Alps—Graian. **Blodig and Purtscheller.**

Z. Deutsch. u. Oesterr. Alpenvereins **26** (1895): 68–119.

Aus den Bergen der Maurienne und der Tarentaise. Von Dr. Carl Blodig und L. Purtscheller. I. *With Illustrations.*

A general account of the Graian Alps.

Austria—Dalmatia—Krka. *M.G. Ges. Wien* **38** (1895): 443–450. **Gavazzi.**

Ein Beitrag zur Hydrologie der unteren Krka. Von Professor Dr. Arthur Gavazzi. *With Map.*

Austria—High Tauern. **Prielmayer.**

Z. Deutsch. u. Oesterr. Alpenvereins **26** (1895): 174–200.

Die Granatspitzgruppe in den Hohen Tauern. Von M. v. Prielmayer. *With Illustrations.*

Austria—Latitudes. **Herr and Tinter.**

Publicationen fur die Internationale Erdmessung. Astronomische Arbeiten der Oesterreichischen Gradmessungs-Commission. Bestimmung der Polhöhe und des Azimutes auf den Stationen: Spieglitzer Schneeberg,

Hoher Schneeberg und Wetrnik. Ausgeführt von Professor Dr. Josef Herr. Nach dessen Tode definitiv gerechnet und herausgegeben von Professor Dr. Wilhem Tinter. Vienna, 1895. Size 12½ × 10, pp. 96.

Austria—Rainfall, etc. ———

Hydrographischer Dienst in Oesterreich. Jahrbuch des K. K. hydrographischen Central-Bureau. I. Jahrgang 1893. Vienna: W. Braumüller, 1895. Size 14⅓ × 10½, pp. viii. and 562. *Map and Diagrams. Presented by the K. K. Hydrographische Central Bureau, Vienna.*

This Report gives statistics of 861 rainfall-stations, and 493 stations for observing daily the levels of rivers in 1893. They are arranged in river-basins, and elaborately discussed. A map of Austria—excluding Hungary—is given on the scale of 1 : 2,250,000, showing the different drainage areas in colour, and the lines of equal rainfall for 1893 in blue.

Austria—Tyrol. *Z. Deutsch. u. Oesterr. Alpenvereins* **26** (1895): 138–173. **Platz.**

Studienfahrten im Gebiete der Vompelkette des Karwendelgebirges Von Ernst Platz. *With Illustrations.*

Austria—Tyrol—Castles. *Z. Deutsch. u. Oesterr. Alpenvereins* **26** (1895): 44–67. **Platter.**

Schlösser und Burgen in Tirol. Von J. C. Platter. *With Illustrations.*

Austrian Alps—Malteinthal. **Kordon.**

Z. Deutsch. u. Oesterr. Alpenvereins **26** (1895): 201–258.

Touren im Bereiche des Malteinthales. Von Frido Kordon. *With Illustrations.*

Balkan Peninsula. *B.S.G. Româna* **16** (1895): 255–275. **Jannescu.**

Raţiunea geologică a principalelor aliniamente geografice, conferetnă de d-nu Lt.-Colonel G. Jannescu. *With Map.*

Danube—Inscriptions. *Ungarische Rev.* **15** (1895): 1–18. **Téglás.**

Neue Beiträge zu den Felsen-Inschriften der Katarakte in der untern Donau. (Auszug der Abhandlung des c. M. Gabriel Téglás.) *With Illustrations.*

Faeroe Islands. *Ann Hydrographie* **23** (1895): 345–354, 403–414. **Broeker.**

Die Faerøer-Gruppe. Auf Veranlassung der Direktion der Seewarte aus dem neuesten dänischen Segelhandbuch übersetzt von Kapt. z. See a. D. Broeker. *With Plates.*

Translation of the last Danish Sailing Directions for the Faeroe islands.

France—Dordogne. *C.R.* **121** (1895): 662–664. **Bouilhac.**

Sur la mise en culture des terres de bruyères de la Dordogne. Note de M. Raoul Bouilhac.

On the utilization of waste land composed of drifting sand with an argillaceous sub-soil.

France—Tarn-et-Garonne. **Gebelin.**

Une grande industrie du Bas-Quercy. Les Chapeaux de Paille de Septfonds et de Caussade. Par Jacques Gebelin. (Extrait du Bulletin de la Société de géographie commerciale de Bordeaux, du 4 Novembre, 1895.) Bordeaux: Feret & Son, 1895. Size 10 × 6½, pp. 16. *Presented by the Author.*

The straw-hat industry was started by a shepherdess, who in 1798 taught herself to plait the straw of the district. Hat-making is now a very large trade, working in Septfonds by electric power, and turning out vast numbers of hats for horses as well as for human customers.

Germany—Aschusleben. *M. Ver. Erdk. Halle* (1895): 75–92. **Damköhler.**

Zur Sprachgrenze um Aschersleben. Von Oberlehrer Ed. Damköhler in Blankenburg a. H.

Germany—Erfurt. *M. Ver. Erdk. Halle* (1895): 1–12 **Kirchhoff.**

Die Lagenverhältnisse von Erfurt . . . von Prof. Dr. A. Kirchhoff.

Germany—Geodesy. ———

Jahresbericht des Direktors des Königlichen Geodätischen Instituts für die Zeit von April 1894 bis April 1895. Berlin: P. Stankiewicz. 1895. Size 9 × 6½, pp. 34.

Germany—Races and Religions. *Petermanns M.* **41** (1895): 249–252. **Langhans.**

Fremde Volksstämme im Deutschen Reich, verglichen mit der Verteilung der Glaubensbekenntnisse. Von P. Langhans. *With Map.*

Germany—Rainfall. ———

Veröffentlichungen des Königlich Preussischen Meteorologischen Instituts. Herausgegeben durch dessen Direktor Wilhelm von Bezold. Ergebnisse der Niederschlags-Beobachtungen im Jahre 1893. Berlin: A. Asher & Co., 1895. Size 13 × 10, pp. lii. and 202. *Map. Presented by the K. Meteorologische Institut, Berlin.*

Germany—Schwarzburg-Sondershausen. **Toepfer.**

M. Ver. Erdk. Halle (1895): 14–75.

Die Wald- und Wasserverhältnisse des Fürstentums Schwarzburg-Sondershausen . . . von Realschuldirektor Dr. H. Toepfer.

Germany—Thunderstorms. **Assmann.**

Veröffentlichungen des Königlich Preussischen Meteorologischen Instituts, [illegible] Direktor Wilhelm von Bezold. Ergebnisse [illegible] Jahre 1891. Von Prof. Dr. Assmann. Berli[illegible] 13½ × 10, pp. lii. and 20. *Diagrams.*

Grecian Archipelago—Andros. *B.S.R. Belge G.* **19** (1895): 429–458. **Hauttecœur.**

Andros. Par Henry Hauttecœur.

Greece. **Hartl.**

Meteorologische und Magnetische Beobachtungen in Griechenland. Ausgeführt von Heinrich Hartl. Separat-Abdruck aus den "Mittheilungen des k. u. k. militär-geographischen Institutes." XIV. Band. Vienna, 1895. Size 9 × 6½, pp. 56. *Map and Diagrams. Presented by the Author.*

Hungary—Budapest. **Körösi and Thirring.**

Publicationen des Statistischen Bureaus des Haupt- und Residenzstadt Budapest. XXV. 2. Die Hauptstadt Budapest im Jahre 1891. Resultate der Volksbeschreibung und Volkszählung. Von Josef Körösi und Dr. Gustav Thirring. Zweiter Band. Berlin: Puttkammer and Mühlbrecht, 1895. Size 11 × 8, pp. 120, and 98. *Maps and Diagram. Price 5 mark. Presented by Mr. Joseph Körösi.*

This contains a series of interesting statistical maps of Budapest, showing in colour the percentage of Roman Catholics, of Jews, of Hungarians, Germans, of persons speaking Magyar, and of illiterates over ten years of age, in each division of the city. A separate map is devoted to each of the distributions mentioned.

Italy. *Deutsche G. Blätter* **18** (1895): 225–247. **Husmann.**

Die Reiskultur in Italien. Von Emil Husmann. II. *With Map.*

Italy—Lakes. *Globus* **68** (1895): 224–227. **Halbfass.**

Die Seenforschung in Italien. Von Dr. Wilhelm Halbfass, Neuhaldensleben.

A summary of recent limnological researches in Italy.

Italy—Map. **Pomba.**

L'Aspect physique de l'Italie, relief à surface convexe à l'échelle de 1 millionième et à hauteurs proportionnelles; imagine et construit (1880–84), par César Pomba. Dessin et reliefs de G. Henri Fritzsche. Mémoire présenté par l'Auteur au Congrès Géographique International de Londres en 1895. Turin, 1895. Size 11 × 7½, pp. 36. *Plate. Presented by the Author.*

Mediterranean Basin. **Hull.**

On the Physical Conditions of the Mediterranean Basin, which have given rise to a community of some species of Fresh-water Fishes in the Nile and the Jordan Basins. By Professor Edward Hull. London: Victoria Institute [n. d.]. Size 8½ × 5½, pp. 10. *Map. Presented by the Author.*

Mediterranean—Columbretes. **Ludwig Salvator.**

Columbretes. Prague: H. Mercy, 1895. Size 13 × 10, pp 178. *Maps, Plates, etc. Presented by H.I.H. the Archduke Ludwig Salvator.*

One of the sumptuous quartos which H.I.H. the Archduke Ludwig Salvator of Austria has devoted to the Mediterranean islands. Tables of the meteorology of the

island, an account of the lithology of its rocks, a short description of fauna and flora, and a general account of the little group are comprised in the volume, which is illustrated by very clever sketches.

Montenegro. *Z. Ges. Erdk. Berlin* **30** (1895): 375–405 **Hassert.**
Die natürlichen und politischen Grenzen von Montenegro. Von Dr. Kurt Hassert.

Norway—Geodesy. **Schiötz.**
Die norwegische Commission der Europäischen Gradmessung. Resultate der im Sommer 1894 in dem südlichsten Theile Norwegens ausgeführten Pendelbeobachtungen von O. E. Schiötz. Christiania: J. Dybwad, 1895. Size 11 × 7½, pp. 16.

Norway—Geodetic Observations. ——
Publication der Norwegischen Commission der Europäischen Gradmessung. Astronomische Beobachtungen und Vergleichung der astronomischen und geodätischen Resultate. Christiania, 1895. Size 11½ × 9, pp. xxvi. and 100. *Map.*

Norway—Jostedal. **Martel.**
Madame Aline Martel. Traversée du Glacier du Jostedal Norvège. Extrait de l'Annuaire du Club Alpin Français 21e volume — 1894. Paris: Typ. Chamerot & Renonard, 1895. Size 9 × 6, pp. 16. *Plates. Presented by the Author.*

Portugal—Agriculture. **Pereira.**
Apontamentos para a Historia das Industrias Portuguezas. A Industria agraria. Por J. M. Esteves Pereira. Lisbon, 1895. Size 7½ × 5½, pp. 112. *Presented by the Author.*

Pyrenees. *Ann. Club Alpin Français* **21**, 1894 (1895): 424–468. **Belloc.**
Recherches et explorations orographiques et lacustres dans les Pyrénées centrales. Par M. Émile Belloc. *With Map and Illustrations.*

Pyrenees—Glaciers. *Ann. Club Alpin Français* **21**, 1894 (1895): 403–423. **Schrader.**
Sur l'étendue des glaciers des Pyrénées. Par M. F. Schrader.

Russia—Finland. *Globus* **68** (1895): 53–57, 74–80, 87–90, 108–112, 123–126. **Köppen**
Die Kulturentwickelung Finnlands. Von N. v. Köppen. Dorpat.

Russia—Lakes. *Globus* **68** (1895): 334–336. **Krahmer.**
Die Seen der Gouvernements Twer, Pskow und Smolensk. Von Krahmer.
An abstract of Professor Anuchin's Russian work on the lakes of European Russia.

Russia—Samara. *Ann. G.* **5** (1895): 50–58. **d'Almeida.**
La colonisation russe contemporaine le long de la Volga. Par M. P. Camena d'Almeida.

Southern Europe—Adige. *Z. Deutsch. u. Oesterr. Alpenvereins* **26** (1895): 1–15. **Penck**
Die Etsch. Von Albrecht Penck.
A geological, hydrographical, and general geographical account of the river Adige from its sources to the Adriatic.

Spain—Village Communities. *Quarterly Rev.* **182** (1895): 483–507. ——
Village Communities in Spain.

Sweden—Longitude determinations. **Rosén**
K. Svensk. Vet.-A. Handlingar **26** (1894): 1–67.
Telegraphische Längenbestimmungen zwischen Lund, Göteborg, Stockholm, Heiligö und Torneå, ausgeführt von P. G. Rosén und R. Larssen. Redigirt von P. G. Rosén.

Sweden—Zoological Station. **Théel.**
Om sveriges zoologiska hafsstation Kristineberg. Af Hjalmar Théel. Stockholm: P. A. Norstedt & Sons, 1895. Size 9 × 6, pp. 48 *Plans and Plates. Map.*

Turkey—Lemnos. *Ann. Club Alpin F.* **21**, 1894 (1895): 279–322. **De Launay.**
L'île de Lemnos. Par M. L. De Launay. *With Map and Illustrations.*

United Kingdom—England—Devon. **Peek**

Rousdon Observatory, Devon. Volume XI. Meteorological Observations for the year 1894, made under the superintendence of Cuthbert E. Peek. London: Printed by Sir J. Causton and Sons, 1895. Size 11½ × 9, pp. 34. *Plate. Presented by Cuthbert E. Peek, Esq.*

United Kingdom—England and Wales—Gazetteer. **Brabner.**

The Comprehensive Gazetteer of England and Wales. Edited by J. H. F. Brabner, [Vol. vi. She-Zou.] London: W. Mackenzie, [1895]. Size 10½ × 7½, pp. 392. *Maps, Plan, and Plates. Presented by the Editor.*

This Gazetteer is now completed, and will be specially noticed in an article on recent Gazetteers.

United Kingdom—English Topography. **Milne.**

The Gentleman's Magazine Library, being a classified collection of the chief contents of the *Gentleman's Magazine* from 1731 to 1868. Edited by George Laurence Gomme. English Topography, Part V. (Hampshire —Huntingdonshire). Edited by F. A. Milne. London: E. Stock, 1894. Size 9½ × 6, pp xii. and 150. *Price 7s. 6d.*

United Kingdom—Scotland—Tay. **Cunningham.**

P.I. Civil Engineers **120** (1895): 299–313.

The Estuary of the Tay. By David Cunningham.

Mr. Cunningham, the harbour-engineer of Dundee, describes the physical condition of the Tay estuary with regard to its shifting sandbanks and the tidal conditions of the water.

Western Europe—Rainfall. *Ann. G.* **5** (1895): 15–24. **Angot.**

Sur le régime pluviométrique de l'Europe occidentale. Par M. A. Angot. *With Map.*

The map shows the average annual rainfall for the period 1861–90, and includes Europe as far east as Rome and Stockholm, and as far north as 60°.

ASIA.

Arabia. *Nineteenth Century* (1895): 595–613. **Bent.**

The Land of Frankincense and Myrrh. By J. Theodore Bent.

Arabia—Muscat. *Contemporary Rev.* (1895): 871–882. **Bent.**

Muscat. By J. Theodore Bent.

Armenia—Ararat. **Rickmer-Rickmers.**

Z. Deutsch. u. Oesterr. Alpenvereins **26** (1895): 315–326.

Ararat. Von Willy Rickmer-Rickmers.

Baluchistan. *J.S. Arts* **43** (1895): 702–712. **Yates.**

The Northern Balochis, their Customs and Folk-lore. By Oswald V. Yates.

Borneo. *Petermanns M.* **41** (1895): 201–208. **Molengraaff.**

Die niederländische Expedition nach Zentral-Borneo in den Jahren 1893 und 1894. Von Prof. Dr. G. A. F. Molengraaff in Amsterdam. *With Map.*

This was noticed in the *Journal* for December, 1895, vol. vi., p. 572.

Central Asia. *Verh. Ges. Erdk. Berlin* **22** (1895): 539–557. **Hedin.**

Von Herrn Dr. Sven Hedin uber seine Reise durch die Takla-Makan-Wüste. *With Map.*

China.

China. Imperial Maritime Customs. I. Statistical Series, Nos. 3 and 4: Returns of Trade and Trade Reports for the year 1894. Part II. Reports and Statistics for each Port. With Report on Foreign Trade of China. Shanghai: the Statistical Department of the Inspectorate-General of Customs, 1895. Size 11½ × 9, pp. viii., iv., and 632. *Diagrams.*

Ditto. No. 6. Decennial Reports on the Trade, Navigation, Industries, etc., of the Ports open to Foreign Commerce in China and Corea, and on the condition and development of the Treaty Port Provinces. 1882–91. First Issue. With sundry maps and a sketch-plan of each port; also

statistical tables relating to the foreign trade of China. Shanghai: Kelly & Walsh; London: P. S. King & Son. 1893. Size 11½ × 9, pp. xii, 694, and lxxxiv. *Presented by the Inspector-General of Customs, Shanghai.*

China—Yangtse Kiang. **Coucheron-Aamot.**

Norske G. Selsk. Aarb. **6**, 1894–1895 (1895): 95–124.

2500 kilometer opover Yangtse Kiang åf W. Coucheron-Aamot. *With Map and Illustrations.*

The author was an officer on a Chinese gunboat when he made the journey on the Yangtse which is here described.

Chinese Empire—Mongolia. **Iwanowski.**

Die Mongolei-Ethnographische Skizze. Von Dr. Al Iwanowski. Leipzig: Jüstel & Göttel, 1895. Size 9 × 6½, pp. 28. *Presented by the Author.*

Chinese Miscellany. **Mesny.**

Mesny's Chinese Miscellany. Vol. I. No. 1. Shanghai: printed at the *China Gazette* Office, 1895. Size 11½ × 9, pp. 24.

The first number of a new weekly journal devoted to miscellaneous information regarding China and the Chinese.

Formosa. *Scottish G. Mag.* **11** (1895): 553–570. **Dodd.**

Formosa. By John Dodd.

A full abstract of the paper read to the British Association at Ipswich, which was noticed in the *Journal* for November, 1895, vol. vi., p. 463.

French Indo-China. *Rev. Scientifique* (4 S.) **4** (1895): 715–718. **d'Enjoy.**

Une incursion chez les Moï. Par M. Paul d'Enjoy.

French Indo-China. *Rev. Française* **20** (1895): 715–719. **Mercié.**

De l'Annam au Mékong. Exploration E. Mercié.

French Indo-China—Tonkin. *Rev. G. Internationale* **20** (1895): 93–98. **Renaud.**

La France à l'Extérieur. Les Travaux publics et les Chemins de fer au Tonkin. Par Georges Renaud. *With Maps and Plate.*

India. *Nineteenth Century* (1895): 870–888. **Colvin.**

Indian Frontiers and Indian Finance. By Sir Auckland Colvin. *With Sketch-map.*

India—Central—Himalayas. **Diener.**

Z. Deutsch. u. Oesterr. Alpenvereins **26** (1895): 269–314.

Mittheilungen über eine Reise im Central-Himalaya von Kumaon, Gurhwal, und den angrenzenden Theilen von Tibet. Von Dr. Carl Diener. *With Illustrations.*

India—Chitral. *Imp. and Asiatic Quarterly Rev.* (2) **10** (1895): 288–311. **Leitner.**

New Dangers and Fresh Wrongs. By Dr. G. W. Leitner. I. The Chitrál Blue-book and Kafiristán. II. The Suppressed Treaties and the Ignored Proclamation. *With Illustrations.*

A separate copy has also been presented by the Author.

India—Frontier. ——

Treaty Series. No. 19, 1894. Convention between Great Britain and China, giving effect to Article III. of the Convention of July 24, 1886, relative to Burmah and Thibet. Signed at London, March 1, 1894 [Ratifications exchanged at London, August 23, 1894.] London: Printed for Her Majesty's Stationery Office, by Harrison & Sons, 1894. Size 10 × 6½, pp. 10. *Map. Price 7d.*

The definition of the frontiers between India and China is given in this paper

India—Kashmir. *Nineteenth Century* (1895): 931–946. **Griffin.**

Kashmir. By Sir Lepel Griffin, K.C.S.I

India—Kashmir. **Lawrence.**

The Valley of Kashmir. By Walter R. Lawrence. London: H. Frowde, 1895. Size 10½ + 8, pp. 478. *Map and Plates. Presented by the Publisher.*

This account of Kashmir is full and authoritative. It deals with the country under the heads—Introductory, Descriptive, Geological, Flora, Fauna, Archæology, Political

History, Physical History, Statistical, Social Life, Religions, Races and Tribes, Agriculture and Cultivation, Live-stock, Industries and Occupations, Trade, the Old Administration, the New Settlement, Language. Special notice will be taken of the book in the *Journal*.

Palestine—Beyond Jordan. *Le Globe* (*Mémoires*) **34** (1895): 109–170. **Gautier.**
Au dela du Jourdain. Souvenirs d'une excursion faite en mars 1894 . . . par M. Lucien Gautier. *With Plates.*

Palestine—Moab and Gilead. **Bliss.**
Palestine Exploration Fund, Q. Statement (1895): 203–235.
Narrative of an Expedition to Moab and Gilead in March, 1895. By Frederick Jonas Bliss, PH.D. *With Map, Plans, and Illustrations.*

A provisional report of the rich archæological discoveries made by Dr. Bliss in his journey beyond the Dead Sea valley last year. It is illustrated by photographs of the ruins, and of some fine pieces of mosaic work.

Persia. **Morgan**
Mission Scientifique en Perse. Par J. de Morgan. Tome Troisième. Études géologiques. Partie II. Paléontologie, par MM. G. Cotteau, V. Gauthier et H. Douvillé. Paris: E. Leroux. 1895. Size 11½ × 9, pp. 142. *Plates.* Ditto. Cartes des rives méridionales de la Mer Caspienne du Kurdistan, du Moukri et de l'Élam. Paris: E. Leroux, 1895. Size 15½ × 11.

Philippine Islands—Health. **Barcones.**
Estudios para una Nosologia Filipina. Por Enrique Mateo Barcones. Madrid, 1895. Size 7½ × 5, pp. 448. *Presented by the Author.*
On the diseases of the Philippine Islands.

Siam. **Fournereau.**
Ministère de l'Instruction Publique. Annales de Musée Guimet. Tome Vingt-Septième. Le Siam Ancien, Archéologie — Épigraphie—Géographie Par Lucien Fournereau. Première Partie. Paris: E. Leroux. 1895. Size 11½ × 9. pp. xii. and 322. *Plates and Facsimile Maps. Presented by the Author.*
This work will be specially noticed.

Siberia—Lena Delta. **Fuss, Müller, and Jürgens.**
Beobachtungen der Russischen Polarstation an der Lenamundung. I. Theil. Astronomische und Magnetische Beobachtungen 1882–1884. Bearbeitet von V. Fuss, F. Müller und N. . . . unter redaction von Dr. A. v Tillo. 1895. Size . . . 96, and vi. *Maps, Plates, and Portraits. Presented by the Imperial Russian Geographical Society.*

Turkey in Asia—Armenian Question. *Blackwood's Mag.* (1895): 483–492. **Harris.**
An unbiassed view of the Armenian Question. By Walter B. Harris.

AFRICA.

Africa. *Scottish G. Mag.* **11** (1895): 512–518. **Elliot.**
Africa as a Field for Colonial Enterprise. By G. F. Scott Elliot.

Africa and British Interests. *J. R. Colonial I.* **27** (1895): 7–44. **Lugard.**
The Extension of British Influence (and Trade) in Africa. By Captain F. D. Lugard, C.B., etc

Africa—Desiccation. *G.Z.* **1** (1895): 425–435. **Reichard.**
Zur Frage der Austrocknung Afrikas. Nach eigenen Beobachtungen. Von Paul Reichard.

British East Africa—Railway. **Molesworth.**
Report by Sir Guilford Molesworth on proposed Railway from Mombasa to Victoria Nyanza, 1895. Size 13½ × 8½, pp. 8. *Map, Diagram, and Sections. Presented by the Author.*

Canary Islands. *B.S.R.G. d'Anvers* **19** (1895): 276–310; **20** (1895): 202–365. **Donnet.**
Les Anversois aux Canaries (un voyage mouvementé au XVI.e siècle). Par M. Fernand Donnet.

Canary Islands—Teneriffe. *G.Z.* **1** (1895): 556–580. **Meyer.**

Die Insel Tenerife und ihre Bewohner. Von Dr. Hans Meyer in Leipzig. *With Map.*

Central Africa. *Mouvement G.* **12** (1895): 289–292. **Wauters.**

Encore la question de la priorité de la decouverte de l'Afrique centrale. Par A. J. Wauters. *With Map.*

Congo Basin—Historical. *G.Z.* **1** (1895): 516–521. **Pahde.**

Die Erforschung des Kongo-Systems. Von Dr. Adolf Pahde.

East Africa—Somali Land. *Koloniales Jahrb.* **8** (1895): 161–171. **Bornhaupt.**

Die deutschen Bestrebungen an der Somali-Küste und das englisch-italienische Abkommen vom 5 Mai, 1894. Im Auftrage der Deutschen Kolonialgesellschaft, bearbeitet von Chr. von Bornhaupt.

East Africa—Somali Land. *J. United Service I. India* **24** (1895): 295-324. **Wellby.**

A trip in Somali Land. By Captain Wellby. *With Map.*

Narrative of a sporting trip south of Berbera.

East Africa—Upper Nile. *Scottish G. Mag.* **11** (1895): 571–581. **Heatley.**

The Port of the Upper Nile in relation to the Highways of Foreign Trade. By James Turnbull Playfair Heatley.

Full text of a paper read at the British Association, an abstract of which appears in the *Journal* for December, 1895, vol. vi p. 571.

Egypt. **Fircks.**

Aegypten 1894. Staatsrechtliche Verhältnisse, wirthschaftlicher Zustand, Verwaltung. Nach amtlichen und anderen Quellen sowie eigenen Wahrnehmungen dargestellt von A. Frhr. von Fircks. Erster Theil. Berlin: D. Reimer (Hoefer und Vohsen), 1895. Size 8½ × 6, pp. viii. and 300. *Maps. Presented by the Publishers.*

The first part of a work on Egypt, containing an account of the political development of the country, a sketch of the geography, fauna, flora, and resources of the land, a full account of the people, and reports on the present commercial and political conditions. There are numerous statistical tables, and an excellent map by R. Kiepert.

Madagascar. **Caustier, and others.**

Publication de la Revue Générale des Sciences. E. Caustier—A. Milne-Edwards—De Faymoreau—L. Suberbie—G. Foucart—Dr. Lacaze—L. Olivier. Ce qu'il faut connaitre de Madagascar. Population—Resources Commerce—Avenir de l'île. Paris: P. Ollendorff [1895, not dated]. Size 12 × 8, pp. 110.. *Maps and Illustrations. Price* 3 *fr.* 50 *c.*

A series of authoritative articles, excellently illustrated by photographic reproductions.

South Africa. **Keane**

Stanford's Compendium of Geography and Travel (New Issue). Africa. Vol. ii. South Africa. By A. H. Keane. London: E. Stanford, 1895. Size 8 × 5½, pp. xvi. and 672. *Maps and Illustrations. Price* 15*s. Presented by the Publisher.*

This will be specially noticed, together with other recent works relating to Africa.

Transvaal. *Rev. Scientifique* (4) **4** (1895): 193–203. **Diamanti.**

Le Transvaal. État politique, économique et commercial. Par M. Octave Diamanti. *With Map.*

Tripoli—Cyrenaica. **Rainaud.**

La Pentapole cyrénéenne et la colonisation. Par M. A. Rainaud. Congrès National des Sociétés Françaises de Géographie. XV^e^ Session—Lyon, 1894. Compte rendu des travaux du Congrès. Lyon: E. Vitte, 1895. Size 10 × 6½, pp. 412-443.

Tropical Africa. *Nineteenth Century* (1895): 442–454. **Lugard.**

New British Markets. III. Tropical Africa. By Captain F. D Lugard.

West Africa. *Ann. Hydrographic.* **23** (1895): 241–244. **Bachem.**

Fahrt in den Bimbia-Fluss und Reise von Kamerun nach Togo und zurück. Hydrographische und meteorologische Notizen S.M.S. "Hyäne," Kommandant Kapt.-Lieut. Bachem. *With Plate.*

West Africa *M. Deutschen Schutzgeb.* 8 (1895): 184–190. **Limpricht.**
Begleitworte zu den Karten "Reiseroute der Expedition des deutschen Kamerunkomitees." Von Dr. M. Limpricht. *With Maps.*

West Africa. *Scottish G. Mag.* 11 (1895): 609–625. **Lugard.**
A Journey in West Africa, and some points of contrast with East Africa. By Captain F. D. Lugard.

West Africa. *B. Comité l'Afrique Française* 5 (1895): 290–298. **Marchand.**
Sept ans d'Afrique, La mission du Capitaine Marchand. *With Maps and Portrait.*

West Africa—Gold Coast. *Globus* 68 (1895): 149–151, 169–172, 189–191. **Mähly.**
Studien von Goldküste. Von Dr. med. Ernst Mähly.

West Africa—Niger Expeditions. *Globus* 68 (1895): 296–298 **Förster.**
Ueberblick über die Niger-Expeditionen der Deutschen, Engländer und Franzosen 1895. Von Brix Förster. *With Map.*

West Africa—Sanga River. *Ann. G.* 5 (1895): 72–89 **Ponel.**
La Haute-Sangha. Par M. Ed. Ponel *With Map.*

NORTH AMERICA.

Canada. *J. Manchester G.S.* 10, 1894 (1895): 253–270. **Derby.**
Canada. By the Right Hon. the Earl of Derby.

Canada—Forests. *P. and T.R.S. Canada* 12, 1894 (1895): 3–20. **Macoun.**
The Forests of Canada and their Distribution, with Notes on the more Interesting Species. By John Macoun

Canada—Geological Survey Report. ——
Geological Survey of Canada. Alfred R. C. Selwyn, director. Annual Report (New Series), Vol. VI. Reports A (1892), A (1893), J, Q, R, S (1892–93). Ottawa: 1895. Size 10 × 7, pp. x., 96, 98, 16, 22, 94, and 212. *Map and Diagrams. Presented by the Geological Survey of Canada.*

Canada—North-West. **Somerset.**
The Land of the Muskeg. By H Somers Somerset. With a Preface by A. Hungerford Pollen. London: W. Heinemann, 1895. Size 9½ × 6½, pp. xxxii. and 248. *Portrait, Maps, and Illustrations. Price* 14*s.*

An interesting narrative of a journey in the interior of the less known parts of Northern America.

Mississippi Valley. *J. Geology* 3 (1895): 749–763. **Leverett.**
The Preglacial Valleys of the Mississippi and its tributaries. By Frank Leverett.

North America—Cabots. *P. and T.R.S. Canada* 12, 1894 (1895): 51–112. **Dawson.**
The Voyages of the Cabots in 1497 and 1498; with an attempt to determine their landfall and to identify their island of St. John. By Samuel Edward Dawson. *With Facsimiles.*

North America—Cartier. *P. and T.R.S. Canada* 12. 1894 (1895): 151–182. **Howley.**
Cartier's Course—a Last Word. By the Right Reverend M. F. Howley, West Newfoundland. *With Facsimiles, etc.*

United States—Mineral Waters **Peale.**
Natural Mineral Waters of the United States By A. C. Peale With Maps.—Fourteenth Annual Report of the United States Geological Survey, 1892–93. By J W. Powell, Director. Part II. Washington: Government Printing Office, 1894. Size 12 × 8, pp. 49–88. *Presented by the U.S. Geological Survey.*

Two maps are given, showing the distribution of mineral springs of commercial importance in all parts of the United States.

United States—New England States. ——
A Summary of the Vital Statistics of the New England States for the year 1892. Boston: Damrell and Upham [1895]. Size 9½ × 6, pp. 60. *Map. Presented by Gardner T. Swarts, Secretary of the State Board of Health, Providence, R.I.*

United States—Niagara. ——

Eleventh Annual Report of the Commissioners of the State Reservation at Niagara for the Fiscal Year from Oct. 1, 1893, to Sept. 30, 1894. The Duration of Niagara Falls and the History of the Great Lakes, 1881–1894. By J. W. Spencer. Second Edition. Albany, 1895. Size 9 × 6, pp. 86 and 126. *Maps and Plates. Presented by Andrew H. Green, President of the Commissioners.*

United States—Stream Measurements. **Newell.**

Results of Stream Measurements. By F. H. Newell.—Fourteenth Annual Report of the United States Geological Survey, . . . 1892–93. By J. W. Powell, Director. Part II. Washington: Government Printing Office, 1894. Size 12 × 8, pp. 89–156. *Maps, Diagrams, and Illustrations. Presented by the U.S. Geological Survey*

The instruments employed in recording river-levels and measuring discharge are first described, and then the records, with diagrams, of the seasonal variations in the Arkansas, Rio Grande, East Carson, Bear, Weber, Provo, Teton, Snake, and Owhyhee rivers are given. These are all in the Rocky Mountain states.

CENTRAL AND SOUTH AMERICA.

Brazil. **Cruls.**

Commission d'Exploration du Plateau Central du Brésil. Rapport présenté à son Ex. M. le Ministre de l'Industrie, de la Voirie et des Travaux Publics. Par L. Cruls, Chef de la Commission. Rio de Janeiro: H. Lombaerts & C., 1894. Size 13 × 9½, pp. viii., viii., and 368. *Plates.*
Ditto. Atlas des Itinéraires, des Profils longitudinaux et de la Zône démarquée, publié par L. Cruls. Rio de Janeiro: H. Lombaerts & C., 1894. Size 18½ × 13½.

This work will be specially noticed.

Brazil—Itatiaya. *G. Tidskrift* **13** (1895): 49–56. **Bøving-Petersen.**

En Bestigning af Brasiliens højeste Bjærg. Ved cand. mag. Bøving-Petersen.

An account of the climbing of Mount Italiaya, the highest summit of Brazil.

Brazil—Rio S. Francisco. *Rev. Trim. I. G. e Hist. Bahia* **2** (1895): 275–279. ——

A navegação dos affluentes do Rio S. Francisco.

Central America. *Petermanns M.* **41** (1895): 117–186. **Sapper.**

Beitrage zur Ethnographie von Südost-Mexiko und Britisch-Honduras. Von Dr. C. Sapper. *With Map.*

Central America—Mexican boundary. **Polakowsky.**

M.G. Ges. Wien **38** (1895): 321–324.

Die Grenze zwischen Mexico und Guatemala. Von Dr. H. Polakowsky *With Map.*

Central America—Yucatan. *Globus* **68** (1895): 247–252, 277–284. **Maler.**

Yukatekische Forschungen. Von Teobert Maler. *With Illustrations*

These illustrations of the ruins of Yucatan practically occupy the whole of two parts of *Globus.*

Chile—Rio Puelo. *Petermanns M* **41** (1895): 190–193. **Steffen.**

Die Erforschung des Rio Puelo. Von Dr. Hans Steffen. *With Map.*

Chile—Sailing directions. **Chaigneau.**

Instrucciones Nauticas de la Costa de Chile. Primera Parte. (De Llanquihue a Coquimbo.) Por J. Federico Chaigneau. Santiago de Chile, 1895. Size 10½ × 7½, pp. vi. and 150. *Plates. Presented by the Chilian Hydrographical Department.*

Chile—Talcahuano. **Fagalde.**

El Puerto de Talcahuano i sus obras de mejoramiento. Dique de Carena.—Arsenal Maritimo.—Dársenas Militar i Comercial. Por Alberto Fagalde. Santiago de Chile, 1895. Size 9½ × 6½, pp. xcviii. and 180. *Plans and Plates. Presented by the Chilian Hydrographic Office*

AUSTRALASIA AND OCEANIC ISLANDS.

Australia—Anthropology. **Mathews.**

P. and T. Queensland Br. R.G.S. Australasia **10** (1895): 46–70.

The Aboriginal Rock Pictures of Australia. By R. H. Mathews. *With Plates.*

Australia—Year-Book. **Greville.**

The Year-Book of Australia for 1895. Edited by the Hon. Edward Greville Sydney, etc. (London: E. Stanford & Effingham Wilson) [1895]. Size 9 × 6, pp. lxvi. and 728. *Maps. Presented by the Editor.*

A valuable book of reference on all matters relating to the Australasian colonies.

Australian Natives' Customs. **Mathews.**

J. and P.R.S. New South Wales **28** (1894): 98–129.

Aboriginal Bora held at Gundabloni in 1894. By R. H. Mathews. *With Plates*

British New Guinea. *J. Manchester G.S.* **10**, 1894 (1895): 271–285. **Macgregor.**

British New Guinea. By Sir W. Macgregor.

Caroline Islands. (*American*) *Missionary Herald* **91** (1895): 311–314. **Price.**

Notes on Ruk and the Mortlock Islands. By Rev. F. M. Price, of Ruk. *With Map and Illustration.*

New Caledonia. **Bernard.**

L'Archipel de la Nouvelle-Calédonie. Par Augustin Bernard Paris: Hachette & Co., 1895. Size 10 × 6½, pp. xxiv. and 458 *Maps. Price* 10*s.*

An excellent geographical monograph showing wide reading in English and German literature as well as French, and a grasp of the principles of Geography. The first part deals with the origin and structure of the island, considering the various land-forming agencies involved, and thereby explaining the configuration. Large scale geological and orographical maps are given. The second part considers the climate, fauna, and flora at considerable length. The third part treats of man, discussing first the aborigines, then the history of discovery, and finally the history of French colonization and the penal system. The work altogether is one on which geographers will not hesitate to congratulate the author.

New South Wales. *P.R.S. Victoria* **7** (N.S.). (1895): 143—156. **Mathews.**

Aboriginal Rock Paintings and Carvings in New South Wales. By R. H. Mathews. *With Plates.*

New Zealand. *New Zealand Alpine J.* **2** (1895): 107–125. **Fitzgerald.**

Mr. E. A. Fitzgerald's Work in New Zealand (2nd notice).

New Zealand—Canterbury and Westland. **Meeson.**

New Zealand Alpine J. **2** (1895): 27–29.

Notes on the Meteorology of Canterbury and Westland, as bearing upon the Features of their Glaciers. By the Editor [J. T. Meeson].

New Zealand—Ruapehu. *New Zealand Alpine J.* **2** (1895): 71–82. **Allison and Hill.**

Early Ascent of Ruapehu. By Thomas Allison.

Ruapehu: Retrospect and Prospect. By H. Hill.

Queensland.

1895. Queensland. Annual Progress Report of the Geological Survey for the year 1894. Brisbane, 1895. Size 13¾ × 8½, pp. 32. *Maps. Presented by Mr. R. L. Jack, Government Geologist.*

Western Australia. *J. R. Colonial I.* **26** (1895). 566—590. **Robinson.**

Western Australia By Sir William C. F. Robinson.

Western Australia—Blue Book.

Western Australia. Blue Book for the year 1894. Compiled from Official Returns in the Registrar-General's Office, Perth, W.A. R. Pether, 1895. Size 13 × 8½, pp. 380

Full statistics for the colony up to the end of 1895

Western Australia—Year-Book. **Fraser.**

Western Australian Year-Book for 1893–94 (eighth year of issue). By Malcolm A. C. Fraser. Perth, 1895. Size 8½ × 5½, pp. x. and 352. *Map.*

The number of commercial companies being floated for the development of Western Australia makes the official statistics of that colony very important in this country; and this year-book, dealing exclusively with official facts, may be accepted as an authoritative account of Western Australia as it is.

POLAR REGIONS.

Greenland. **Garde.**

Tour du Monde **1** (N.S.), (1895): 385, 405, 417, 429, 441, 453, 465, 477. Un été au Grœnland. Par M. Th. V. Garde. Traduit du danois par Charles Rabot. *With Map and Illustrations.*

Peary's Arctic Journey. *Norske G. Selsk. Aarb.* **6**, 1894–1895 (1895): 80–94. **Astrup.**

Det arktiske problem og de to Peary—expeditioner. Slædereise til Melvillebugten af Eivind Astrup. *With Map and Plate.*

Spitzbergen. *Norske G. Selsk. Aarb.* **6**, 1894–1895 (1895): 1–50. **Alme and Heyerdahl.**

Om Spitsbergen og den Wellmanske polarexpedition af cand. real. H. H. Alme. *With Map and Portraits, etc.*

"Kane's" Reise langs Spitsbergens vestkyst af Trygve Heyerdahl.

MATHEMATICAL GEOGRAPHY.

Decimal Division of Angles. **Rey-Pailhade.**

Le temps décimal. Par M. J. de Rey-Pailhade. Congrès National des Sociétés Françaises de Géographie. XV^e^ Session. Lyon, 1894. Compte rendu des travaux du Congrès. Lyon: E. Vitte, 1895. Size 10 × 6½, pp. 223–230.

Geodesy—Levelling. *B.S.G. Lisboa* **14** (1895): 195–281. **Avila.**

Dos nivelamentos de precisão e da sua superficie de referencia. Pelo Conde d'Avila. *With Plates.*

On exact levellings, and the surface to which they are referred, including a description of various forms of recording tide-gauges, with a discussion of their curves.

Map Projections. *G.Z.* **1** (1895): 497–516. **Bludau.**

Ueber die Wahl der Projektionen für die Länderkarten der Hand- und Schulatlanten. Von Dr. Alois Bludau in Pr. Friedland. *With Plate.*

A discussion of the map projections best adapted for use in school atlases.

Maps—Projection. *B.S.G. Paris* **16** (1895): 177–182. **Germain.**

Projet d'une carte de la terre au 1 : 1,000,000^e^, choix du système de projection. Par A. Germain.

Relief Globe. **Reclus.**

Elisée Reclus. Projet de construction d'un Globe Terrestre à l'échelle du Cent-millième. Edition de la Société nouvelle, 1895. Size 10 × 6½, pp. 16. *Presented by the Author.*

Treats of the construction of a relief globe of the Earth on the scale of 1 : 100,000, a subject on which the author spoke at the London Geographical Congress.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Deserts. *Ann. G.* **5** (1895): 1–14. **Lapparent.**

Dépressions et déserts. Par M. A. de Lapparent.

This paper is noticed in the *Journal* for December, 1895, vol. vi. p. 574.

Experimental Geography. *C.R.* **121** (1895): 657–659. **Meunier.**

Essai d'application de la méthode expérimentale à l'histoire orogenique de l'Europe. Note de M. Stanislas Meunier.

The author speaks of a method for experimentally imitating the dislocations of the crust on a contracting globe.

Forests and Mountains. **Guénot.**

Des effets du déboisement des montagnes. Par M. Guenot. Congrès National des Sociétés Françaises de Geographie. XV^e^ Session. Lyon, 1894. Compte rendu des travaux du Congrès. Lyon: E. Vitte, 1895. Size 10 × 6½, pp. 231–255.

Geological Climate. *Petermanns M.* **41** (1895): 252–256. **Woeikow.**

Geologische Klimate. Von Prof. Dr. A. Woeikow in St. Petersburg.

Limnology. *Globus* **68** (1895). 357–361. **Greim.**

Die Fortschritte der Limnologie. Von Dr. G. Greim.

A critical resumé of recent researches on lakes.

Meteorology. *Z. Ges. Erdk. Berlin* **30** (1895): 368–374. **Baschin.**

Zur Frage des jahreszeitlichen Luftaustausches zwischen beiden Hemisphären. Von Otto Baschin.

Also separate copy. *Presented by the Author.*

Meteorology. *Rev. Maritime et Colon.* **127** (1895): 168–178, 272–322. **Duponchel.**

La circulation des vents et de la pluie. Notes complémentaires et explicatives. Par M. A. Duponchel.

Meteorology—Cyclones. **Kitao.**

J. College Sci. Imp. University, Japan **7** (1895): 293–402.

Beiträge zur Theorie der Bewegung der Erdatmosphäre und der Wirbelstürme (dritte Abhandlung). Von Dr. Phil Diro Kitao.

Meteorology—Forecasting. *Ann. Hydrographie* **23** (1895): 379–387. **Bebber.**

Der Wetterdienst an der Deutschen Seewarte. Von Prof. Dr. W. J. van Bebber.

An account of the weather-forecasting arrangements at the German Naval Observatory in Hamburg.

Oceanography—Waves. *C.R.* **121** (1895): 15–19. **Boussinesq.**

Lois de l'extinction d'une houle simple en haute mer. Par M. J. Boussinesq.

Physical Geography. **Tarr.**

Elementary Physical Geography. By Ralph S. Tarr. New York: Macmillan & Co., 1895. Size 8 × 6, pp. xxxii. and 488. *Illustrations. Price* $1.40. *Presented by the Publishers.*

Professor Tarr was fortunate in writing this little book, by having a larger work on the same subject nearly ready for publication, and he has certainly been able in many ways to advance upon the similar works which have preceded his. This is a true physical geography, giving special prominence to land-shaping agencies and their result. The numerous illustrations are very well chosen, but sometimes they are reproduced on a scale so small as to lose their effect.

Plant modification. *Ann. G.* **4** (1895): 393–419. **Bonnier.**

Les plantes de la région alpine et leurs rapports avec le climat. Par M. Gaston Bonnier. *With Maps and Illustrations.*

Illustrations are shown of the forms exhibited by the same plant grown in the plain and on the mountain slopes.

ANTHROPO-GEOGRAPHY AND HISTORY

Anthropo-geography. *G.Z.* **1** (1895). 361–375. **Hettner.**

Die Lage der menschlichen Ansiedelungen. Ein Vortrag. Von Alfred Hettner.

This will be referred to in the Monthly Record.

Anthropology **Fewkes.**

A Comparison of Sia and Tusayan Snake Ceremonials. By J. Walter Fewkes. Reprinted from the *American Anthropologist.* Vol. viii. No. 2. Washington, April, 1895. Washington: Judd & Detweiler, 1895. Size 10 × 6¼, pp. [24.] *Presented by Francis Parry, Esq.*

Anthropology. **Lemire.**

Du rôle de la femme dans la colonisation. Par M. Ch. Lemire. Congrès National des Sociétés Françaises de Géographie. XV^e^ Session. Lyon, 1894. Compte rendu des travaux du Congrès. Lyon, E. Vitte, 1895. Size 10 × 6½, pp. 389–393.

Anthropology. **Ratzel.**

The History of Mankind. By F. Ratzel. Parts I.–III. London: Macmillan & Co. [1895]. Size 10 × 7, pp. 48. *Maps and Illustrations. Price* 1*s. Presented by the Publishers.*

We welcome the commencement of the English version of a very important work, which deservedly holds a high reputation in the scientific world. The style of printing and illustration leaves nothing to desire.

Commercial Geography. **Annenkoff.**

Conférence sur l'importance de la Géographie en vue de la crise économique et agricole actuelle. 1895. Size 11 × 9, pp. 16. [Par le Général Annenkoff.] *Presented by the Author.*

Proof of a paper read at the Sixth International Geographical Congress.

Historical—Leif Ericson. ———

Flateyjarbok. Published by the Royal Danish General Staff. Topographical Department. Copenhagen, May, 1893. Size 19½ × 17, pp. [28]. *Presented by Clements R. Markham, Esq.*

This is a facsimile of the old Icelandic MSS. of the Saga of Leif Ericson with translations in English and Danish in parallel columns. It is the text of the earliest record of the discovery of America.

Historical Maps ———

Sokaart-Archivets Antike Kaartsamling, 1895. Copenhagen. F. Dreyer, 1895. Size 9½ × 6, pp. 78.

A catalogue of the marine charts in the Royal Archives in Copenhagen.

Historical—Map Projections. *Mem. S.G. Italiana* **5** (1895): 165–201. **Fiorini**

Sopra tre speciali projezioni meridiane e i mappamondi ovali del secolo XVI. Memoria del socio M. Fiorini.

Language. **Wallace.**

The Expressiveness of Speech; or, Mouth-gesture as a factor in the origin of language. By Alfred R. Wallace. Reprinted from the *Fortnightly Review* for October, 1895. London: Chapman & Hall. Size 10 × 6½, pp. 16 *Presented by the Author.*

BIOGRAPHY.

Biography. ———

Biographies of Ferreira de Amaral, Luciano Cordeiro, and Ernesto de Vasconcellos [in French]. From "*Portugal em Africa.* Revista Scientifica, Publicação mensal." No. 19—July, 1895. Lisbon. Size 10½ × 7, pp. [144]. *Map and Portraits.*

This number of *Portugal em Africa* contains, in addition to the portraits and biographies, a series of papers by various authors on Portuguese colonization and the history of discovery.

Biography. **Plarr.**

Men and Women of the Time. A Dictionary of Contemporaries. Fourteenth Edition. Revised and brought down to the present time. By Victor G. Plarr. London: G. Routledge & Sons, 1895. Size 9 × 6, pp. viii. and 986.

Heber. **Smith.**

Bishop Heber, Poet and chief Missionary to the East, second Lord Bishop of Calcutta 1783–1826. By George Smith. London: John Murray, 1895. Size 8¾ × 5½, pp. xx. and 370. *Map, Portrait, and Illustrations.* Price 10s. 6d. *Presented by the Author.*

This may be viewed as a companion volume to the author's Life of Henry Martyn, recently noticed in the *Journal*.

Rawlinson. **Cordier.**

Notice sur Sir Henry C. Rawlinson, Bart. Par M. Henri Cordier. (Extrait du Compte rendu des Séances de la Société de Géographie, No. 6, 1895.) Paris. Size 9 × 5½, pp. 4. *Presented by the Author.*

Rawlinson. *Le Globe B.* **34** (1895): 135–144. **Chaix.**

Le Général Sir Henry Rawlinson. Par M. le prof. Paul Chaix.

Strozzi. *Mem. S.G. Italiana* **5** (1895): 110–148. **Uzielli.**

Piero di Andrea Strozzi viaggiatore fiorentino. Del prof. Gustavo Uzielli.

Thomson. *Scottish G. Mag.* **11** (1895): 524–528. **Bartholomew.**

Joseph Thomson. By J. G. Bartholomew.

GENERAL.

Ballooning. *Blackwood's Mag.* (1895): 669–678. **Powell.**

A Trip Heavenward: Ballooning as a Sport. By B. Baden Powell.

An animated description of the methods and incidents of ballooning.

NEW MAPS.

By J. Coles, *Map Curator*, R.G.S.

EUROPE.

England and Wales. **Ordnance Survey.**

Publications since November 7, 1895.

1-inch—General Maps :—

ENGLAND AND WALES:—241, 343, hills engraved in black or brown; 259, 329 (revision), engraved in outline, 1*s.* each.
IRELAND :—157, hills, 1*s.*

25-inch—County Maps :—

ENGLAND AND WALES :—**Berkshire** (revised), XLIA. 4, 7, 8; XLIIA 1, 2; XLII. 10, 11, 13, 14; XLIII. 9, 10, 11, 12. **Cornwall** (revised), XLVI. 14. **Hampshire** (revised), II. 10, 11, 13, 14, 15, 16; III. 9, 10, 11, 12, 13, 14, 15, 16; VII. 4, 7, 8, 11, 12, 15, 16; VIII. 1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 16; XV. 8. **Middlesex** (revised), XIX. 8, 15; XX. 1, 5, 13; XXIV. 3, 8, 12; XXV. 1, 5. **Surrey** (revised), XIII. 3, 4, 7, 8, 9, 10, 13, 14. **Wiltshire** (revised), XLIII. 4, 7, 8, 11, 15, 3*s.* each.

Town Plans—5-feet scale :—

London—Re-survey, I. 68; III. 22, 33, 34, 35, 44, 45, 55, 61, 72, 82, 83, 92; VI. 50; VII. 3, 7, 18, 19, 20, 39, 40, 80, 81, 82, 89, 90, 92, 93, 96, 97, 98, 99, 100; VIII. 53; X. 19, 41, 43, 60; XI. 1, 3, 12, 19, 22, 33, 34, 36, 37, 38, 39, 41, 44, 45, 47, 48, 50, 53, 54, 57, 58, 59, 62, 63, 64, 67, 69, 73, 75, 78, 81, 86, 87, 88, 89, 90, 94, 98, 100; XII. 11, 12, 21, 31, 41, 43, 44, 51, 52, 53, 62, 63, 71, 72, 73, 81, 83; XV. 2, 34, 35, 45; XVI. 75, 2*s.* 6*d.* each. Index, 3*d.*
(*E. Stanford, Agent.*)

Scotland. **Bartholomew.**

The Royal Scottish Geographical Society's Atlas of Scotland. A series of sixty-two plates of maps and plans illustrating the topography, physiography, geology, natural history, and climate of the country. By J. G. Bartholomew, F.R.S.E., F.R.G.S. Drawn, engraved, and printed at the Edinburgh Geographical Institute, 1895. *Presented by the Author.*

During the time that this excellent atlas has been in course of preparation, notices have appeared in the *Geographical Journal*, calling attention to the careful and thorough manner in which the maps had been prepared, and the very clear style in which they had been produced. It is several years since Mr. J. G. Bartholomew commenced the work which he has now brought to so successful a conclusion. The labour involved in the compilation of such an atlas as this has of necessity been very great, including as it does the information contained in the Ordnance, Admiralty, and Geological Surveys of Scotland, as well as the data obtainable from the Scottish scientific societies.

The basis of the atlas is the Ordnance Survey, and it consists of forty-five sectional maps, on the uniform scale of half an inch to the mile, in addition to which a series of physical maps are given. Where the Ordnance Survey has been known to be out of date, the maps of that district have been revised by persons possessing a special knowledge of the locality.

The first ten maps are devoted to the physiography, meteorology, geology, natural history, languages, and political divisions of Scotland. These are executed with special skill, knowledge, and care. The maps showing distribution of population and languages are in reality original, are highly suggestive, and are models of tinting. Besides a geographical map, there are several maps showing the distribution of various classes of animals. The meteorological maps are of the most detailed character. These are followed by the sectional maps on the half-inch scale, printed, where necessary, in contours, with fourteen shades of colour, showing the elevations of the land and depths of the sea. The new county and parish boundaries, as determined by the recent Boundary Commission, are shown; while the accuracy with which the new roads, railway and steamer routes have been laid down, as well as the thoroughly revised town plans, render this atlas invaluable as a work of reference to tourists and others.

The accompanying letterpress, which will be found on the opening pages of the atlas, has been contributed by the following gentlemen: the late John Bartholomew on geography; Sir Archibald Geikie, geology; Prof. J. Geikie, physiography; and

Dr. Alexander Buchan, on meteorology. These are such well-known authorities on the subjects of which they treat, that their names are sufficient guarantee of the value of their contributions. Professor James Geikie's contribution is an excellent study in physical geography, while the other information given is all appropriate and well arranged. The chronology of the cartography of Scotland is of special interest to the geographer.

The manner in which the maps have been produced reflects credit on all who have had a hand in their preparation; and, taken as a whole, this atlas marks a new departure in the cartography of Scotland. The delicacy and precision of the shades of tinting and the beauty of the colours used will stand comparison with the best work of the kind in any country. The work shows that, with the material at the command of the map publisher, and under the direction of such a capable geographer as Mr. J. G. Bartholomew, it is possible to produce an atlas equal, both as regards its accuracy and style of production, to any that has been published in Europe or America. It should be noted that Mr. Bartholomew does not take to himself the credit of the work done by others. He mentions by name every one inside and outside his establishment who has been engaged in the production of this atlas.

AFRICA.

Somaliland. **Christie, Sparrow, and Mainwaring**

Sketch of the Routes in Somaliland, travelled by R. B. B. Christie, Esq.; Lieut. R Sparrow, 7th Dragoon Guards; and Major H. G. Mainwaring, 1st Batt. South Wales Borderers, in 1894. Scale 1:1,267,200 or 20 stat. miles to an inch. *Presented by the Authors.*

West Africa. **Johnston.**

W. & A. K. Johnston's map to illustrate the Ashanti Expedition in West Africa. Scale 1:710,000 or 11·2 stat. miles to an inch. Messrs. W. & A. K. Johnston, London and Edinburgh. *Price* 1*s. coloured. Presented by the Publishers.*

Witwatersrand. **Goldman.**

Map of the Witwatersrand. Scale 4100 feet to an inch. By S. Goldman. Corrected to May, 1895. 2 sheets. *Price* £1 10*s. G. Philip & Son, London.*

This map has been corrected to May, 1895. It shows the position and extent of all the mining claims of the Witwatersrand, and several insets of special districts are given on enlarged scales. In the notes on the body of the map, there is a general description of Witwatersrand, its geological formation, and gold-mining. The map appears to have been carefully prepared, and will no doubt be useful to persons interested in the gold-mining industry of South Africa.

Zululand. **Garrard.**

Map of Zululand, showing the Relative Positions of the various Gold and Coal Fields, and the Routes of Approach. Compiled to accompany the Report on the Mineral Resources of Zululand, dated January, 1895, by J. Jervis Garrard, ASSOC.M.INST.C.E., Deputy-Commissioner of Mines for Zululand. Scale 1: 316,800 or 5 stat. miles to an inch. *Price* 10*s.* 6*d. G. Philip & Son.*

The localities where coal and gold are to be found in Zululand are indicated on this map, as well as the positions of native kraals, and the routes by which the gold and coal fields can be approached.

AMERICA.

Ecuador, etc. **Dowding.**

Map showing Explorations and Surveys of Captain H. W. Dowding, R.N., from Quito, down the course of the Rio Napo to its junction with the Rio Marañon, 1893. Scale 1: 2,100,000 or 33 stat. miles to an inch. E. Stanford, London. *Presented by Captain H. W. Dowding, R.N.*

Peru. **Raimondi.**

Mapa del Peru. A. Raimondi. Scale 1: 500,000 or 7·9 stat. miles to an inch. Engraved and printed by Erhard Bros., Paris. Sheets 17, 18, 19, 20, 22, and 24. *Presented by the Geographical Society of Lima.*

The six sheets which form the present issue of this map include a portion of

Central Peru, and the coast from Pativilca to Pisco. Twenty-three sheets of this map have now been published, leaving eleven to complete it. It is printed in colours; the rivers and lakes in blue, the forests green, and the hill work in brown. It is nicely drawn, the hill shading is very effective, and at the bottom of each sheet a full explanation is given of the conventional signs used.

CHARTS.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, during September and October, 1895. *Presented by the Hydrographic Department, Admiralty.*

No.	Inches.	
394	m = 4·9	England, south coast:—Spithead. 2*s.* 6*d.*
693	m = 6·7	Harbours on the east coast of England:—Whitby harbour. 1*s.* 6*d.*
2353	m = 1·0	France, west coast:—Rade de Croisic to Presqu'ile de Quiberon. 2*s.* 6*d.*
2610	m = 4·9	France, north coast:—Fécamp. Treport. 1*s.* 6*d.*
1195	m = 4·47	Spain, east coast:—Approach to port of Barcelona (plan, port of Barcelona). 2*s.* 6*d.*
430	m = 1·0	Corsica, west coast:—Lava bay to Cape Morsetta. 2*s.* 6*d.*
564	m = 14·4	Sardinia, north coast:—Maddalena and approaches. 2*s.* 6*d.*
369	m = various.	Plans in the Cape Verde islands:—St. Vincent, St. Lucia, Branca and Raza, St. Nicholas, Mayo, Rolla road, Tarrafal bay (St. Antonio island), Sal, Porto Praya, English road (Bonavista island), Mordeira bay, Fajao D'agua, Tarrafal bay (St. Jago island), English road (Mayo island). 2*s.* 6*d.*
2876	m = 0·5	Newfoundland, west coast:—Codroy road to Bear head. 2*s.* 6*d.*
2670	d = 3·4	America, east coast:—Halifax to the Delaware. 2*s.* 6*d.*
411	m = various.	Anchorages on the north coast of Cuba:—Bahia Honda, Nuevas Grandes, Port Manil, Puerto de las Nuevitas del Principe, Port Matanzas, Channel of Puerto de las Nuevitas del Principe (*reproduction*). 1*s.* 6*d.*
418	m = various.	Anchorages on the north coast of Cuba:—Port of Monati, port of Cibara, Port Jururu, Port Padre, Port Bariai (*reproduction*). 1*s.* 6*d.*
423	m = various.	Anchorages on the north coast of Cuba:—Puerto de Vita, Port Sama, Port Naranjo, Port Banes, Port Nipe (*reproduction*). 1*s.* 6*d.*
428	m = various.	Anchorages on the north coast of Cuba:—Ports of Cabonico and Levisa, Port Cananova, Port Tanamo, Port Cebollas, Port Yaguaneque (*reproduction*). 1*s.* 6*d.*
373	m = various.	Plans in the Gulf of Mexico:—Coatzaccalcos river, mouth of the Coatzacoalcos river, Alacran reef, Alacran port, Cay Arenas and adjacent reefs, Eastern and Southern Triangles, Arcas cays, Sisal reefs, Sisal reef, Madagascar reef, Anchorage off Sisal (*reproduction*). 2*s.* 6*d.*
2348	m = 4·35	North America, west coast:—Sitka harbour and approaches. 1*s.* 6*d.*
1215	m = 1·5	Anchorage on the west coast of Africa:—Benguela bay. 1*s.* 6*d.*
685	m = 0·37 to m = 6·28	Africa, east coast:—Bazaruto bay (Pungo bay), Limpopo river entrance. 1*s.* 6*d.*
704	m = 0·5	Madagascar, north-west coast:—Nosi Shaba to Moramba bay, including Narendri bay. 2*s.* 6*d.*
377	m = 0·5	Madagascar, west coast:—Moramba bay to Maromanjo point, including Mahajamba bay. 2*s.* 6*d.*
794	m = 0·25	Strait of Malacca:—Pulo Berhada to Cape Rachado 2*s.* 6*d.*
415	m = 1·64	Philippine islands:—Pujaga bay 1*s.* 6*d.*
416	m = 2·68	Paláwan island:—Malanut y Nakoda. 1*s.* 6*d.*

1338 m = 3·0 China sea:—Pescadores islands, inner channels. 2*s.* 6*d.*
770 { m = 5·85 } Anchorages in Japan, inland sea:—Tomo Assa,
{ m = 1·95 } Himeshima roads 1*s.* 6*d.*
2211 m = 9·58 Samoa, or Navigator islands:—Apia harbour. 1*s.* 6*d.*
1382 m = 0·5 Society islands:—Tahiti and Murea (plan, Papetoai and Paopao bays) (*reproduction*). 2*s.* 6*d.*
1300 Plans on the coast of Chile:—Plan added, Huentelauquen cove.
1278 Cape Paquica to Cape Lobos:—New plan, Huaina, Pisagua bay.
2195 Sketch-plans of anchorages in the eastern part of Celebes:—Plans added, Gorontalo river, Tilamuta harbour.
2196 Sketch-plans of anchorages in the southern part of Celebes:—Plan added, Kali Susu bay.
1508 Anchorages in New Hebrides islands:—New plan, Steep Cliff bay.

(*J. D. Potter, Agent.*)

Charts Cancelled.

No.		Cancelled by	No.
1195	Port of Barcelona	New Chart. Approach to port of Barcelona (plan of port of Barcelona)	1195
368	Tarrafal bay	New Chart. Plans in Cape Verde islands . . .	369
369	St. Vincent		
377	St. Lucia, Branca and Raza		
378	St. Nicholas		
379	Sal		
381	English road, Mordeira bay		
382	Mayo		
384	Porto Praya		
2670	Halifax to the Delaware	New Chart. Halifax to the Delaware	2670
415	Port Matanzas anchorages	New Chart. Anchorages on the north coast of Cuba	411
416	Nuevitas del Principe		
411	Bahia Honda		
413	Port Mariel		
417	Nuevas Grandes		
418	Port Manati	New Chart. Anchorages on the north coast of Cuba	418
419	Port Padre		
420	Port Cibara		
421	Port Jururu		
422	Port Bariai		
423	Puerto de Vita	New Chart. Anchorages on the north coast of Cuba	423
424	Port Naranjo		
425	Port Sama		
426	Port Banes		
427	Port Nipe		
428	Ports of Cabonico and Levisa	New Chart. Anchorages on the north coast of Cuba	428
429	Port Tanamo		
430	Port Cebollas		
431	Port Cananova		
432	Port Yaguaneque		
373	Coatzacoalcos river	New Chart. Plans in the Gulf of Mexico . . .	373
1203	Alacran shoal and port		
1206	Sisal reefs and anchorages		
1209	Cay Arenas and adjacent reefs		
1829	Arcas cays		
1830	Obispo shoals, Eastern and Western Triangles		

2348 Sitka harbour and approaches	New Chart. Sitka harbour and approaches . . .	2348
627 Plan of Benguela bay on this sheet	New Chart. Anchorages on the west coast of Africa	1215
704 Narendri bay and Antambo river	New Chart. Nosi Shaba to Moramba bay, including Narendri bay	704
794A, 794B North and south sands	New Chart. Pulo Berhada to Cape Rachado . .	791
770 Tomo and Hime Sima roads	New Chart. Anchorages in Japan, Inland sea . .	770
1730 Plan of Apia harbour on this sheet	New Chart. Apia harbour.	2211
1382 Tahiti and Murea	New Chart. Tahiti and Murea	1382
931 Anchorages in Celebes		

Charts that have received Important Corrections.

No. 2598, Curves of equal Magnetic Variation. 1118A, Scotland, north coast:—Shetland isles, Sheet 1. 1118B, Scotland, north coast:—Shetland isles, Sheet 2. 122, North sea, Netherlands:—Mouths of the Maas. 2362, Sweden, Sheet 4:—Landsort to the Gulf of Bothnia. 2297, Gulf of Bothnia:—Hango head to South Quarken, including Aland islands. 2431, North America, west coast:—Port Simpson to Cross sound. 1499, North America, west coast:—Cross sound to Kadiak. 1421, Africa, east coast:—River Chind, bar and entrance. 1390, Africa, east coast:—Chale point to Pangani, including the island of Pemba. 40, India, west coast:—Karachi harbour. 2460, Pacific Ocean:—Kamchatka to Kadiak island. 2383, Solomon islands:—Marovo lagoon. 1570, Pacific ocean, New Hebrides:—Malo island to Efate island. 2225, New Hebrides:—Ambrym island. 1339, Pacific ocean, Samoa islands:—North coast of Upolo, between Falifa harbour and Falulu point.
(*J. D. Potter, agent.*)

United States Charts. **U.S. Hydrographic Office.**

Pilot Charts of the North Pacific Ocean for September, October, November, and December, and North Atlantic Ocean for August, September, and October, 1895. Published monthly at the Hydrographic Office, Bureau of Navigation, Department of the Navy, Washington, D.C. Charles D. Sigsbee, Commander U.S. Navy, Hydrographer. *Presented by the U.S. Hydrographic Office.*

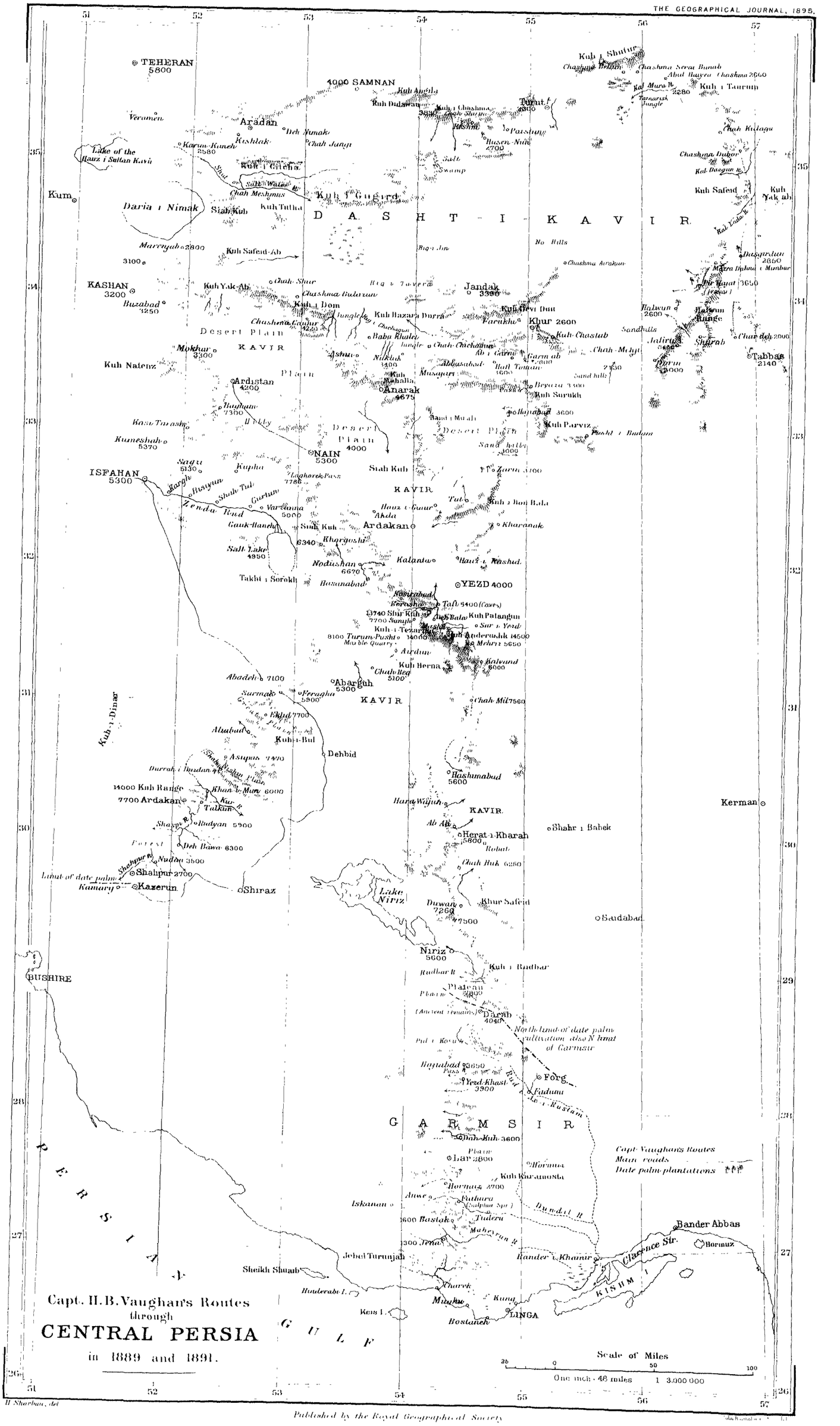
PHOTOGRAPHS.

South Africa. **Holub.**

Dr. Emil Holub's Südafrikanische Ausstellung, Prag. 1892. B. Anthropologie und Ethnologie. An Album containing 38 Photographs. *Presented by Dr. Emil Holub.*

This is a series of 38 photographs of models prepared under the superintendence of Dr. Emil Holub from his sketches. The figures and dwellings from which the photographs are taken are natural size, and the time occupied in their preparation was four and a half years. They are intended to represent scenes during Dr. Holub's travels in South Africa, in addition to which there are photographs of numerous natural history specimens.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.



Capt. H. B. Vaughan's Routes through

CENTRAL PERSIA

in 1889 and 1891.

H. Sharman, del.

Published by the Royal Geographical Society

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EXPLORATION IN THE JAPANESE ALPS, 1891–1894.*

By the Rev. WALTER WESTON, M.A.

So much has been written about the "Land of the Rising Sun" during the last quarter of a century, that it would at first sight seem almost impossible to say anything new. The general characteristics of the people, of their country, and of their institutions have been dealt with over and over again. Books have been written containing observations extending over all imaginable periods of time, varying from 'Nine Years in Nippon' to 'Three Weeks in Japan.' Indeed, one may scarcely look forward to the Ultima Thule, of the downward limit, being reached till the publication of the remarkable work with which residents in Japan have been threatened by their globe-trotting visitors —'Five Minutes in Japan,' in two volumes.

My own apology for venturing to offer a paper on travel in Japan is that the holiday wanderings which furnish the material for it led me almost entirely off the beaten tracks. The districts I visited year after year are several days' journey from the treaty ports and from the usual haunts of those who only take Japan as one of many countries visited during a trip round the world, or on a voyage to or from the East. Without some knowledge of the language and habits of the people, such wanderings would have scarcely been possible, and to the acquisition of this knowledge the average traveller could scarcely be expected to give the necessary time and labour. Several portions of the range were visited some twenty years ago by Mr. William Gowland, F.C.S., etc., late of the Imperial Japanese Mint, who has kindly favoured

* Paper read at the Royal Geographical Society, December 9, 1895. Map, p. 229. The map is based on 'The Geological Survey of Japan—Reconnaissance Map Topography, Division III.'

me with some notes of his explorations. He was the first foreigner, I believe, to climb Yarigatake and Norikura, two of the highest peaks in the range. He went as the representative of one of the Government Departments to report on the mineral character of certain districts, and his observations are very valuable. So far as I can gather, however, scarcely any European seems to have followed him for nearly fifteen years, excepting an occasional traveller across the Harinoki or Nomugi passes. I was induced myself to go to the range six years ago by Professor Chamberlain, and each summer afterwards I returned with greater pleasure. Besides climbing the peaks and traversing the valleys previously visited by Mr. Gowland, I had the pleasure of ascending most of the other mountains, which the natives said had not yet been touched by foreign travellers. The chief of these were O Renge, Jonendake, Kasadake, Hodakayama, and one or two minor ones. I also recrossed several passes which for many years did not seem to have been traversed by any others than an occasional hunter or government surveyor. Since I went, however, almost entirely as a holiday climber, I trust due allowance will be made by those who naturally regard matters of scientific interest as of the chief importance.

In the mountain systems of Japan, two main lines can be clearly distinguished. They are visible not only in relief, but also in geological structure. The first is called the China system, for it is connected with South-East China, and runs up from the south extremity of the Japanese Archipelago in a north-easterly direction. The second is known as the Karafuto system, and enters Japan at its north end from Karafuto (the Japanese name for Saghalien), and runs towards the south-west. These two systems meet near the borders of the provinces of Hida and Shinshu; and it is here, in the middle of Hondo (the main island of Japan), that the country attains its greatest width, and that the mountains assume their noblest proportions in the range which has received from foreign travellers the name of the "Japanese Alps." Curiously enough, the Japanese have no distinctive name of their own, strictly speaking, for this or any other range as a whole. In bygone days polytheistic Buddhism provided each individual summit with a guardian deity, and therefore with a name, as regards the more familiar peaks. The less-known ones in the interior, however, were given titles, descriptive of their personal appearance, by the plain country folk dwelling beneath their shadows; but it has been left to foreign (European) geographers and travellers, like Naumann, Rein, Satow, and Gowland, to deal with and to describe the physical features of the country according to scientific methods.

Roughly speaking, the direction of the range (of the Japanese Alps) is from north to south. Its north end rises in steep granite cliffs from the Sea of Japan exactly on the 37th parallel of north latitude. Its situation and general elevation are about the same as those of the

Sierra Nevada of Spain, which it closely resembles in distant outline. Towering steeply to a height of about 10,000 feet, it is far wilder, more broken, and more difficult of ascent than any other range in Japan. Its impressive appearance is compared by the people of the neighbouring plains to a row of gigantic screens that shut off nearly all communication between the inhabitants of the provinces whose natural boundary it forms. The granite cliffs at the north extremity are known as *Oya shiradzu ko shiradzu*, i.e. "knowing neither parents nor children." In former times the road that now passes high up in the face of the cliffs did not exist, and in order to get between the villages



HODAKAYAMA FROM THE EAST.

on either side of the rocky promontory, one had to make a dash along the beach at its foot whilst the receding tide was still out. It was, however, always a case of *sauve qui peut*, and each man had to "take care of No. 1," as there was no time even to help those nearest and dearest to him. From these granite cliffs, that rise from the Sea of Japan, the range stretches southwards to Norikura, an ancient double-peaked volcano. Then comes a deep saddle, from which rises another extinct volcano, the celebrated sacred mountain Ontake, from which the heights gradually sink towards the south-west. The whole length of the chain is

about 100 miles, and it separates the provinces of Etchū and Hida on the west from those of Echigo and Shinshū on the east.

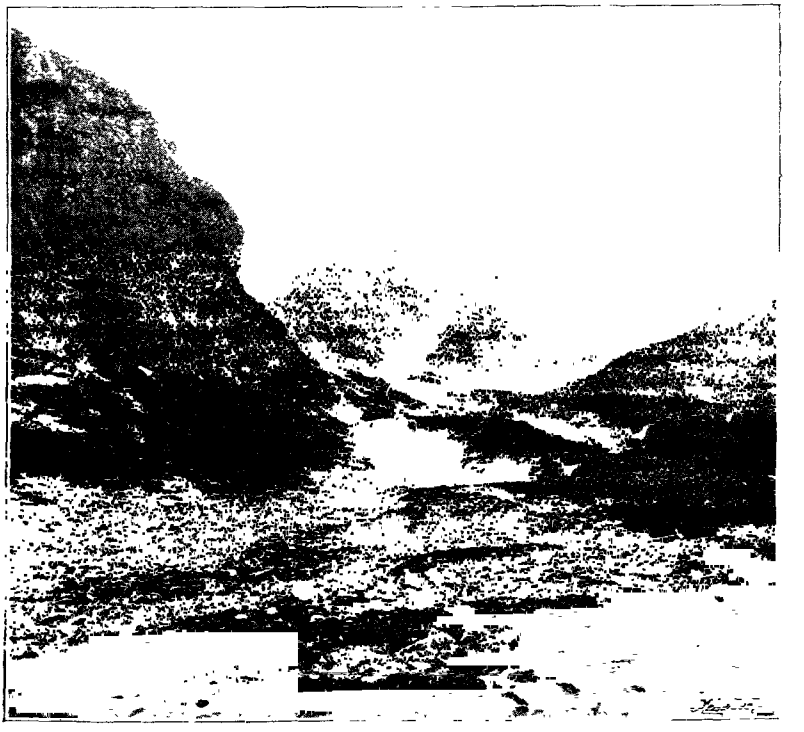
The range is of dissimilar geological structure, and its peaks are of different ages. Briefly, it may be described as a backbone or axis of granitic rocks, through or over which vast quantities of igneous and volcanic rocks have been poured from time to time. The south end is remarkable for extensive beds of shales near Norikura, where on the east side they are partly overlaid in a very curious way by one of the old lava streams. The most striking volcanic peaks are Tateyama, Norikura, and Ontake. O Renge, Kasadake, and Jonendake are chiefly composed of andesite rocks. But the most beautiful mountains in form are Hodakayama, whose granite towers give it the name of the "mountain of the standing ears of corn"; and its northern neighbour Yarigatake, "the Spear Peak," the Matterhorn of Japan, which consists of an intensely hard, weather-resisting porphyry breccia. These peaks, and the wild broken ridge that connects them, exhibit the most striking mountain scenery in Japan. From the top of Yarigatake, the view embraces practically the whole width of the main island at its broadest span, some 150 miles in extent, from the Sea of Japan nearly to the Pacific Ocean.

Turning from peaks to passes, there is little to be said. The inaccessible character of the range cuts off nearly all intercourse between the people on either side. Starting from its northern extremity, we only find one pass in a distance of 50 miles. This is the Harinoki-toge, "the pass of the alder trees" (8120 feet), leading from Omachi on the east to Toyama, the capital of the province of Etchū, on the west. Since it was originally opened twenty years ago, it has become so damaged by landslips and avalanches that it has been for long practically abandoned, and only an occasional hunter or government surveyor seems to visit it. When I crossed it in 1893, I was told it was many years since any European traveller had been over it, though I knew of two parties that had unsuccessfully made the attempt. The three days' hard work that the crossing takes brings one into contact with some of the wildest of Japanese alpine scenery. Granite cliffs rise thousands of feet above deep-cut ravines, and roaring torrents are fed by slopes of snow that are often encircled by lovely alpine flowers of every hue. Further to the south, a more permanent way has been found across the northern shoulder of Norikura. The Abo-toge leads us through the loveliest of sylvan scenery and torrent-dinned ravines, at a height of 6400 feet, from the plain of Matsumoto eastwards to the plateau of Takayama. This pass connects the two chief silk-producing districts of Japan. A slightly different route, crossing more to the south, known as the Nomugi-toge, is perhaps more popular, as it is practicable for cattle. This also connects the same districts as the Abo pass.

Besides magnificent mountain forms, wild ravines, and wall-like

precipitous cliffs, we find a great abundance of water. Sometimes, it is in the form of a clear lake of solemn stillness; at another it is in charming falls and cascades, or in murmuring streams deep buried in some shady forest gorge.

The eastern side of the range is drained almost entirely by the Hime-gawa and the Saigawa, which both flow northwards into the Sea of Japan. On the west the water is carried off into the bay of Toyama (an arm of the Sea of Japan) by the Jinzu-gawa, the Jogwanjigawa, and the Kurobe-gawa. These last three rivers are notorious for the destruction almost every year caused by the autumnal rains. Rising on the west side of the range, their courses are short, and their currents very swift,



RIDGE SOUTH OF YARIGATAKE, FROM THE NORTH-EAST.

and their broad flat deltas are annually inundated with such rapidity that landslips and great loss of life and property ensue.

The lakes in this region are few. Aoki ko, near the source of the Hime-gawa, and the deep turquoise of the sulphurous crater-pools on Norikura, Tateyama, and Ontake, are very pretty, though insignificant in size.

Erosion on the largest scale is seen between Tateyama and the sea, towards the north-western limits of the range. Here one of the old

outbursts of volcanic rock is carved into huge outlines resembling islands by the action of the Yugawa, a torrent-feeder of the Jogwanjigawa. The gorge of the Azusagawa, where that river has cut through the subsidiary range, east of the main chain, on its way to the plain of Matsumoto, is also a typical example of the erosion by which several of the other gorges leading up to this great backbone of Japan have been carved out. It is through this ravine of the Adzusagawa that the eastern portion of the Abo-toge, already referred to, passes on its way between Matsumoto and Takayama.

Near the hot springs of Tateyama (known as Tateyama Onsen, or Ryuzanjita), striking evidences are seen of the terrific power of seismic phenomena. All around the spot is a wilderness of large boulders, sand, and stones. Mountain-sides dashed down by the violence of the earthquake which took place in 1858, still remain a mass of confusion to tell the awful tale of the destruction which was then wrought. A large portion of the north side of Otobi San, a rugged mountain south of the Onsen, was thrown across the valley and dammed up the stream. Later on, when the snow melted and the water burst its barrier, the villages miles down the course of the torrent were deluged with liquid mud, and houses, fields, and human beings were overwhelmed in one common destruction.

Although thunderstorms are usually neither frequent nor violent in most parts of Japan, they are by no means uncommon in the central parts of this range. When crossing the Harinoki pass in 1893, I witnessed one every day for a week, occurring almost at the same moment on successive afternoons with mathematical regularity.

The position of the long chain of the Japanese Alps makes it responsible for a curious climatic phenomenon. As the cold, dry north-westerly wind sweeps over from Siberia across the Sea of Japan, it there mingles with a warmer and moister air; so that when it finally reaches the west face of this great mountain barrier, this moisture is precipitated in an abundant fall of snow on the west flanks and summits of the chain. Consequently, for some three or four months during the winter and early spring, we gaze upon an extraordinary contrast. On the west of the range the valleys are deep in snow, and the sky is obscured with a dark veil of clouds; on the east, however, for months together, a bright sky cheers us, and comparatively little snow covers the ground. In order to meet the exigencies of such a heavy snowfall, the houses on the west and north-west have to be specially constructed. Like Swiss châlets, they are provided with widely overhanging eaves, and the roofs are weighted with heavy stones. Occasionally, also, galleries run along the whole length of a street, to afford communication from house to house when the roadway is blocked deep with snow. It is often found necessary to live in the top storey altogether. Light and air are then admitted through paper windows in the chimneys.

The various houses can sometimes only be distinguished by sign-posts stuck in the snow or on the roofs. Some of them bear such inscriptions as these: "The post-office is beneath this spot;" "You will find the police-station buried below."

In spite of the abundance of the winter snowfall on the west, no traces of glacial action have been found, here or elsewhere, in Japan. There are no glaciers, nor have any moraines, striated rocks, or erratic blocks been discovered. The lowest level of what one may call per-



RAVINE SOUTH OF KASADAKE.

manent snow is about 7000 feet, though, in comparatively sheltered gullies, I have found it, even in August, lying as low as 5500 feet.

In this land of volcanoes, however, the absence of those interesting results of the action of cold is more than compensated for by the effects of the superabundance of heat. No country in the world can rival Japan in the matter of hot springs, and this is especially the case in portions of the Japanese Alps. Some of the sulphur springs are very remarkable, especially those on Tateyama towards the north of the range. Here the solfataras are called *O jigoku* ("great hell"), a familiar

name for such phenomena in Japan. As one stands on a little hill, half a mile from the climbers' hut at the base of the final peak, the whole of the valley below appears alive with bubbling pools of boiling mud and sulphur. From clefts in the sides of the mounds that dot the valley, jets of steam and sulphuretted hydrogen burst forth sometimes with a deafening roar, and with force enough to project lumps of the sulphur deposit to a distance of 15 or 20 feet. In some of the pools boiling water of a dark green or yellow colour is shot up to a height of several feet, and as it falls back again into its pit, it is again thrown out with equal violence. It is from such spots as these that much of the sulphur found in Japan is obtained, the deposit sometimes being as much as several feet thick.

It has been very truly remarked that the *grande passion* of the Japanese is hot-water bathing. Cleanliness is one of the few original items of Japanese civilization. Nearly all their other institutions have been introduced from China excepting baths; for the Celestial sarcastically tells us that only such dirty people need to wash so often. But, in spite of the fickleness usually ascribed to the Japanese, their original love for hot water has never grown cold. In the mountains, therefore, wherever hot mineral springs are found, as they frequently are, we find the peasantry resorting to them with a double object in view. Invalids come for the sake of the healing virtues of the waters; their healthy friends come to keep them company, and to kill time pleasantly. The *yuba*, i.e. "hot-water houses," as these bathing-establishments are called, usually nestle at the bottom of some deep ravine, or occasionally are found perched high up on the slope of one or other of the great volcanoes. The bath itself consists of one or more wooden tanks 10 or 15 feet square, fed by water conducted from the mineral spring through bamboo pipes. Overhead is a roof of shingling, but the sides are open to the free air. The temperature of the water varies from 100° to 130° Fahr. In the humbler classes of yuba, the bathers are accommodated in long roughly built shanties divided into cubicles some 10 feet square, each of which is inhabited by six or more persons. For room-rent and the use of the bath each pays about a halfpenny a day, but food and bedding are not supplied. Occasionally, however, the caretaker has a sort of office or store where one may purchase such luxuries as dried fish, sugar, and eggs. At *yuba* of a better class the visitors stay at châlets or inns close by the baths, and in some cases the larger guest-houses have baths on the premises. Both sexes bathe together, but the behaviour of one and all is above reproach. Some years ago, out of deference to European feelings of propriety, a police regulation was issued in the larger towns on the beaten tracks, directing males and females to occupy separate compartments. In many cases, however, where the prowling policeman was not too strict in his interpretation of the rule, the difficulty was overcome by stretching across

the bath a piece of string to denote "This side for ladies, that for gentlemen."

The Japanese in these out-of-the-way mountain resorts indulge their taste for bathing to an incredible extent. In one place I know of,* where the water is just about blood-heat, a man will stay in, it is said, practically for a month on end, taking care, however, to place a heavy stone on his knees, to keep him from floating or turning over in his sleep. The caretaker of this particular establishment, a cheery old man of some seventy summers, himself stays in the bath the whole winter through. In the case of another spot famed for its thermal springs, the inhabitants apologized to a friend of mine for what they called their dirtiness, when he happened to visit their neighbourhood on a holiday



OUTER EDGE OF CRATER OF ONTAKE.

tour. "For," they said, "it is the summer-time, and we are too busy to bathe more than twice a day." "How often, then," he asked, "do you bathe in the winter?" "Oh, then we have more leisure, and we can bathe four or five times a day, and the children get into the water whenever they feel cold"! At some bath-houses I have visited, it is a favourite practice of some of the bathers to while away the time by reciting portions of the popular dramas of the day. The effect of such recitations is said to be greatly enhanced by reason of the acoustic properties of the confined space and the damp air which these places afford to perfection. When the visitors return to their homes from the

* Cf. Chamberlain's 'Things Japanese'

sulphur springs, they take with them packets of the sulphur deposit to use in their own baths, just as we might employ Tidman's sea salt. It goes by the name of *yu no hana* ("flowers of the hot water"), and is highly prized.

Although the mineral wealth of these mountains seems to be at present imperfectly ascertained, there are one or two silver and copper mines of some importance on the west side of the range. The chief one is near Hirayu, on the west flanks of Norikura, near the source of the Takaharagawa, in the province of Hida. When climbing that mountain by a new route in 1892, I was very hospitably received and entertained by the overseer and his assistants, though I was the first European to visit the place. The mine is at an altitude of 7000 feet, high up the mountain-side, and work goes on all the year round. Some 150 men and women are employed, and I was told the annual output is about 140,000 lbs. of copper and 2500 lbs. of silver. Possibly the latter item is rather above the mark. At the village of Hirayu, 3000 feet lower down, are the smelting furnaces, stores, etc., connected with the mine. Each year I revisited the place, the air of increased prosperity told a tale of growing success.

In the north of the range limestone is found in several places, and is burnt for manure. On Kurodake, the "dark peak," fine rock crystals are dug out, and taken to Osaka and Tokyo for sale. Indeed, the only object the rustics attribute to one's repeated visits to these wild regions is either to search for crystals or for silver mines. Mountaineering for pleasure is too absurd an idea to be treated as serious, though the good folk are far too polite to even pretend to say so.

One of the most remarkable features of the Japanese Alps is the extent and variety of the flora of the region. On the lower flanks of most of the mountains, especially in the southern portion of the range, we find a sort of prairie called *hara*. It is this *hara*, and the mountain woodland generally connected with it, that form the home of that wonderful variety of plants in which Japan is so rich. No one who has not seen something of this "variegated floor of living mosaic" can quite understand the grouping of Japanese plants. The name is well deserved by which the natives sometimes call it, *o hana batake* ("the great flower-field"). Not only does it include many of our familiar English wild flowers, but side by side with them are numbers of our favourite ornamental plants, together with many others quite strangers to us. Besides the more common species, we find the beautiful *Lychnis grandiflora*, and varieties of magnificent lilies (*auratum*, *tigrinum*, etc.) These, with the purple iris and the noble large blue bell of the Japanese *kikyo* (*Platycodon grandiflorum*), give a gorgeous colouring to the face of the field. In the forests the wistaria and the delicate petals of many-tinted hydrangeas light the gloom, and the tall graceful fronds of splendid circular ferns recall the feathery crown of some old-time

Red Indian chieftain. To enumerate the inhabitants of these mountain forests would be to name half the entire flora of Japan. Wild strawberries, raspberries, and gooseberries refresh the climber on his way. On the great granite peak of Hodakayama I discovered, for the first time on record in Japan, the black currant growing wild. On both sides of the range the Japanese Alps bear the most beautiful cypress forests. The wood of these trees, especially that of the *hi-no-ki* (*Chamæcyparis obtusa*), is much valued for lacquer, on account of its



ONO NO TAKI (WATERFALL) ON NAKASENDO.

white colour and other qualities. It is also largely used in building Shinto temples, etc. Near Funatsu, on the west side of the chain, we meet the Japanese yew tree (*ichii* or *araragi*), celebrated for its beautifully grained reddish timber. It is, however, found rather as a shrub than a tree, and is scattered through the forests, not standing in separate clumps. Of forest creepers the most interesting is the *Kadzura japonica*, called by the Japanese *Kurogane modoshi*, i.e. "iron creeper." Its stems are so strong and elastic that they are frequently used as substitutes

for ropes. A curious sort of suspension bridge, of a form now dying out, used to be constructed of them in primitive regions. The other commonest forest trees, besides conifers, are birches, beeches, and oaks. On the latter two, as well as on maples and willows, we sometimes see mistletoe growing. The associations, however, that Christmas-time connects with it amongst ourselves are quite unknown to the Japanese. Indeed, the custom it suggests to us is considered by them to be both barbarous and unhygienic; and a schoolboy I know of one day spontaneously offered his English teacher an essay on the subject entitled "Kys," stating his reasons for holding kissing to be a dangerous practice, and concluding with the sarcastic query, "Is this civilized nations' custom?" Above the upper forest limit (*i.e.* about 7000 feet or so), we find a dwarf pine called *goyonomatsu* ("five-needle pine"). Higher up, the most noticeable plants are a yellow violet, a curious dwarf single-flowered azalea, and (as well as at various other altitudes also) the beautiful Japanese alpine bell, the *Schizocodon soldanelloides*. The latter, both by its form and its dwelling-places, reminds one vividly of its European kinsman, the *Soldanella alpina*. With its lovely bells it encircles the melting snowdrifts in the summer-time, whilst 2000 or 3000 feet lower down it flowers early in the spring. It is both larger and more beautiful than the European sort, and is found over a much more extensive zone. It is probable that the flora of these high mountain regions of Japan, with its peculiar admixture of alpine and northern plant forms, originates from East Siberia and Kamtschatka. From its original home it has been carried southward chiefly by the cold and violent monsoons and currents, and then up the mountains by valley winds.

The land fauna of Japan, generally speaking, principally points to the neighbouring continent, *i.e.* to North China, Korea, and Manchuria. Chief amongst the animals found in this alpine region is the *kuma*, or black bear. It sometimes attains a length of over six feet, and its flesh is smoked and eaten. Its skin, as well as that of the Japanese chamois and other animals, is exposed for sale in the larger villages. In the north end of the range the badger is very common, and is much valued both for its flesh and its fur; but it is also much feared for the power it is supposed to possess of bewitching people. In the forests high up the mountain-sides boars are found. Deer are also hunted in the winter, when the deep snow and beasts of prey, especially wolves, drive them down into the valleys. Hares, which turn white in winter, are trapped, and flying squirrels are not uncommon. One sort of squirrel is called the *momodori*, or "peach-bird," and usually spends the daytime, the light of which it shuns, in hollow tree-trunks. The marten is common, the Japanese name for it, oddly enough, being *ten*.

Of birds, the beautiful golden eagle leads the way, though I have only occasionally seen it, and that in the most solitary places. Besides the

kite, which is common, we have a curious black and white speckled crow, and extremely tame ptarmigan abound near the upper snowfields.

A magnificent specimen of copper pheasant sometimes startles us with its sudden whirr and with the flash of its gorgeous plumage through the upper forest glades. Though the birds of Japan are popularly said (probably by deaf persons) to be songless, the *uguisu*, or nightingale, gives this the lie, as it floods the silence and shade of the lonely forests with its liquid deep-voiced melody. The most remarkable animal of all, however, is now fast dying out. This is the giant salamander (*Cryptobronchus japonicus*) found chiefly in the south-west spurs of the range, as well as in one or two other regions between 34° and 36° N. lat. It appears to have usually preferred the clear mountain streams of granite and schist ranges at a height of 2000 to 4000 feet above the sea. It feeds mostly upon trout (in which these mountain streams abound) and upon the larvæ of insects and the smaller batrachians. Its flesh is valued chiefly for its medicinal uses, and for keeping the water clean in wells. The largest specimens, sometimes 5 feet long, are brought to the principal cities, where they are found as curiosities in naturalists' shops. Whilst its near relatives are found in China and in North America, its closest kinsman of all is the one whose remains were found by Scheuchzer at Œningen. Owing, however, to its weak reproduction and limited distribution, it will probably soon follow its departed cousin, that *homo diluvii testis*, and at no distant date will cease to form part of the living fauna of Japan. In some of the mountain torrents a sort of lizard is found, which is much prized for the sake of its flesh. Numbers are caught, dried, skewered on sticks, and sold as a remedy for the nervous diseases of children. Certain kinds of snakes are also treated in a similar way.

May I now call your attention to some characteristics of the people of these interesting out-of-the-world regions? When once the explorer gets into the mountains, he finds the travel of the roughest character, but the manners of the people are always polished, and exhibit still the perfection of true politeness. Kindly hospitality is met with wherever one goes, and one soon learns to find good breeding is not the exclusive prerogative of a particular class, and that it is not the monopoly of the educated and the well-to-do.

One or two illustrations may serve as types of the whole. During a mountaineering expedition, not previously made by a foreign traveller, near a wild, almost uninhabited valley, the only accommodation I could get was at a solitary *yuba* (bath-house) of the roughest kind. On my arrival with a request for shelter, I was received by an old grey-haired man of threescore and thirteen, who combined the dignity of a prince with the simplicity of a peasant. During the two days I spent under his primitive roof, he treated me with a courtesy and attention that could not be excelled. His only anxiety was that I should find the

accommodation too rough and rude. Without my wishing it, he turned out (as I subsequently discovered) the people who were in the best room he had. He always contrived to let me have the public bath (which, I may mention, was planted just outside the front door) to myself. He made me a present of cakes of the sulphur deposit from the solfatara hard by, to take home to use in my own bath. The only favour he asked me was that, one evening at dinner-time, he might be allowed to come upstairs and sit at the top of the ladder, in the open doorway, to see how and what the foreigner ate at dinner. When I was leaving I asked him what I had to pay for his hospitality. How puzzled the old gentleman was! Shaking his head, he said he really didn't know, as he had never entertained an "honourable Mr. Foreigner before." After much pressing to name his own price, he finally ventured to murmur, with an air almost of shame at the exorbitance of the demand, "Well, really, do you think 5 sen (1½*d.*) would be *too* much?" On another occasion, when planning an ascent of another peak hitherto unclimbed by any foreigner, I found there was no inn within two days' journey of the mountain. The nearest house was that of the *soncho*, i.e. headman of the district. To my astonishment, when I arrived there at the close of a summer afternoon, it turned out to be a country villa worthy of the suburbs of Tokyo. Though I was a perfect stranger to him, the *soncho* received me most cordially. With many apologies for (as the Japanese conventional phrase puts it) "the disgustingly filthy accommodation," he placed a lovely pair of guest-rooms at my disposal. As we sat on the verandah overlooking the garden, discussing cakes and tea, I told him my plans, to which he listened with the politest attention. Then an attendant produced the tobacco tray, liliputian pipes were lighted, hunters were sent for to act as my guides, and everything was done to further my wishes. The next morning an additional surprise was in store. The son of the *soncho* himself volunteered to share my expedition, which ultimately was brought to a successful issue on the third day. Evening drew on as we approached the house on our return. To my surprise, the young man suddenly left me without a word, and hurried on in advance into the family quarters. For a while I felt decidedly uncomfortable, thinking I had unconsciously offended him. By-and-by, however, a domestic approached, and begged me to "honourably condescend to enter into the honourable hot bath." I then realized my friend's haste had simply been owing to his desire to show hospitality by having my bath ready on my arrival. It was a little bit of spontaneous kindness which showed that getting into hot water is not always a proof that one has "put one's foot in it" with one's friends. The following day we said our *sayonara*, and reluctantly turned away, with the reiterated "Please honourably deign to come back again," still ringing in our ears, and mingling with the regrets of a sweet-voiced childish farewell. One could not but feel how well deserved the title

still is by which this kindly people once delighted to call their country *Kunshi no koku*, "the land of gentlemen."

The kindness of the civilians is almost matched by the politeness of the officials with whom one occasionally has to deal. A memorable instance of this was afforded by a country policeman I met last summer in the north part of the range. Not only did he get all the information for me he could from the peasants in the neighbourhood about a peak, not yet visited by foreigners, which I wanted to ascend, but he even volunteered to accompany me on my climb. For four delightful days he proved a cheery companion. He was only 5 feet high, but his dignity was very great and commanded respect wherever we went; even to the summit of our mountain he insisted on wearing his two-handed sword and dirty white cotton gloves. He was always imperturbably good tempered, and even if I fell out of my hammock in my sleep when in camp, and landed on him as he happened to be lying beneath, he would never make any further reference to the inconvenience than to offer the humble apology, "*O jama wo itashimashita*" ("I am sorry to have been in your way").

Amongst the most interesting classes of people dwelling in or near the mountains are the hunters of big game. They are sturdy fellows, inured to hardship and capable of tremendous exertion. It is they alone who know anything of the wild valleys and the great peaks, for there they roam when chasing the bear, the boar, or the chamois in their haunts, and it is from amongst them I have always got my guides. Their garments consist of short tunic and tight knickerbockers of blue homespun hempen cloth of a very tough character. The legs are protected from thorns, tree-stumps, and snow by leggings of raw hemp or closely woven straw. On the feet, in the summer-time, they wear straw sandals called *waraji*, but in the winter these are discarded for boots of raw bearskin with the hairy side inwards. When chasing game over soft snow, the hunter fastens circular snowshoes under his boots. Should the snow be hard, he uses *crampons* called *kana-kanjiki*. These consist of metal crosses with the ends turned down and sharpened into spikes. For additional warmth, a chamois-skin is thrown over the shoulders. His weapons include an old-fashioned muzzle-loader, a spear, and a heavy knife. Occasionally, for hand-to-hand fighting with bears, he carries a double-handed sword with a point as sharp as a needle and an edge as keen as a razor. The frame used for carrying loads on the back is almost identically the same as that used by porters in the Swiss Alps and elsewhere.

During the summer months the one occupation which absorbs the attention of the majority of people dwelling in the plains that skirt the range on either hand is the culture of the silkworm. The plateau of Shinshū, on the east side of the Japanese Alps, is the chief silk-producing district in Japan. There is very little cattle to tend, as pasture land

does not exist; but the mulberry tree is grown all over these regions, and in the hottest weeks of summer the silkworms require constant attention, so voracious are their appetites. It is then often difficult to get porters for one's expeditions, even at high prices, as I have constantly been told that all the men's time was fully taken up with feeding the *o ko sama* ("the honourable Mr. Baby"), as the silkworm is sometimes fancifully called. The growing number of silk filatures in the towns and villages everywhere witnesses to the increasing proportions of this great industry.

It may not be generally known that the Japanese Government have established a number of fully equipped meteorological stations all over the empire, which issue valuable reports daily. The country folk,

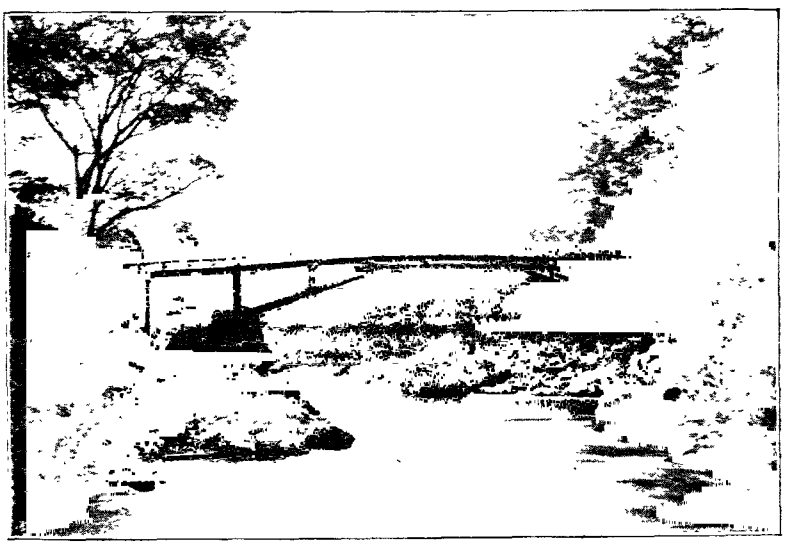


SILK FILATURES ON THE TENRYUGAWA.

however, are without these helps, and depend upon their own observations for weather forecasts. Some of them, as the results of long experience, are distinctly interesting. For instance, amongst the signs of clear weather are the following circumstances: When a dog comes out of his usual shelter to sleep in an exposed place; when an echo is heard to the pigeon's coo: when the *tombi* (kite) cries in the evening; when the charred soot on the wick of the *andon* (native paper lamp) is red: when the rainbow spans the east. Signs of rain are seen: when the earth-worm crawls out of the earth, when the cocks go to roost earlier than usual; when the moon looks low; and when the crow (the Japanese bird of love) washes himself in the water, you may confidently count on rain the very next day. Signs of approaching wind are: when the stars seem to waver in their places; when ravens

croak together in unusually large numbers; and when the murmur of the river is unusually loud.

Most interesting of all are the curious superstitions which still linger, to an extent quite unsuspected by the average traveller in Japan, among the simple-minded rustics, who as yet have scarcely even heard of such a thing as Western civilization. It all reminds me of a curious Daibutsu, *i.e.* colossal image of Buddha, which stands, or rather sits, in the precincts of an ancient temple near my former Japanese home. The image was erected some five or six years ago, and is of the usual conventional type familiar throughout Japan—with one exception. In the middle of the forehead the artist has placed a jet of electric light! This extraordinary combination of ancient and modern



HASHIDO, BRIDGE OVER ONTAKEGAWA.

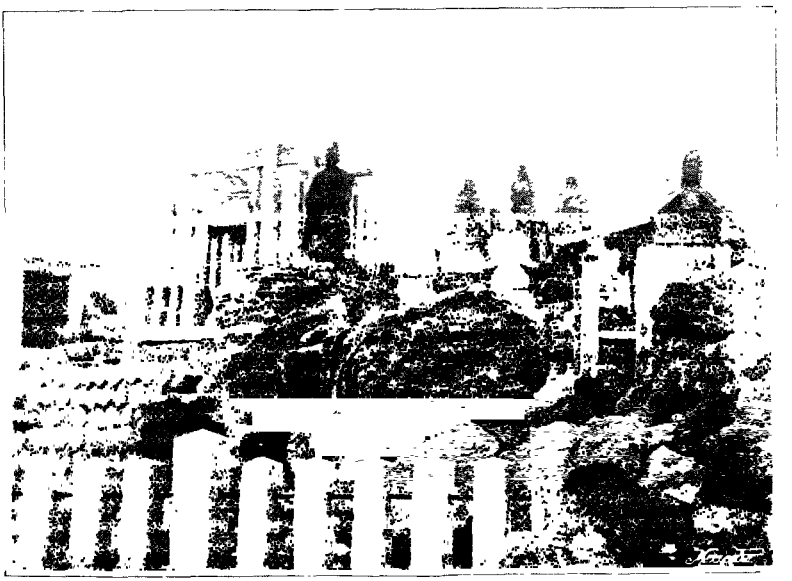
is a parable of Japan to-day. In the crowded capital and treaty ports you will find modern innovations on every hand—telephones, electric lights, miniature reproductions of our British navy, or of the military system of our Teutonic neighbours, and what not. But come with me far away into the shadows of the great mountains, and hold intercourse with the simple, kindly, superstitious rustics who dwell there, and you will realize your intellectual surroundings are those of the ninth century rather than of the nineteenth.

Some incidents drawn from my own personal experience may serve to illustrate my meaning. For three successive years I visited Gamada, the remotest village in the centre of the Japanese Alps, in order to get guides for the ascent of a beautiful peak, Kasadake, that towers up above the adjoining valley. Each time I was put off with a trifling

excuse; and not until I left for good, and finally applied to the chieftain of a band of hunters inhabiting some huts higher up the valley, did I learn the real reason or get the assistance I sought. The villagers of Gamada, the chieftain explained, believe that far up the mountain wild cliffs form the home of a great spirit. Should the villagers be so wicked as to allow a Western intruder to defile the sacred precincts of the peak with his alien feet, the punishment will be the immediate destruction of their fields and gardens by sudden and violent storms.

On another peak in the same part of the range a curious experience befell me, which may illustrate this same superstition still further. I was just returning from the ascent, the first by a foreign traveller, of Hodakayama, the loftiest and grandest granite peak in the Japanese Alps. The last part of the descent lay through a dense tangle of bamboo grass in the depth of a gloomy forest at the base of the mountain. Suddenly I noticed my leading guide stop dead, and begin to dance about with the most extraordinary antics. He had stepped upon a wasp's nest, hence his activity; and a moment later I also came in for a share of their attention, and was soon writhing in agony from a dozen stings. A few minutes before I had been mourning over the loss of the heel of one of my boots (which had got torn off during the rough ten hours' climb), and also over the now dilapidated state of my clothing. So the occurrence formed an apt illustration of the Japanese proverb that corresponds to our own, that "troubles never come singly," for it runs *Naku tsura wo hachi ga sasu*, "It is the weeping face that the wasp stings." Later on in the evening, I was drying my things at the camp fire in a hut at the base of the mountain, when one of my Japanese companions came and asked to see the wounds the wasps had inflicted. Pointing them out, I turned to the fire again and continued my operations. Presently I happened to look round; I then found the man squatting on the floor close by, intently gazing on the wounds, and waving his hands over them in a series of mesmeric passes. This over, he arose, went to the door of the hut, and turned his face to the great mountain that now rose stately and solemn in the light of an oriental moon. Clapping his hands to attract the attention of the god, and bowing his head in the attitude of prayer, he made his petition to the spirit of the mountain, on my behalf. Finally he clapped his hands again to show the god he had finished with him, returned to me at the fireside, and in a solemn voice said, "This is what we call *majinai* (i.e. exorcism); you will be all right in the morning." His meaning was that I, as a foreigner, had offended the god of the mountain by trespassing on his sacred domain, and what looked to me and felt like wasps were really spirits of vengeance sent to punish me. My friend Nakazawa, however, possessing the power of exorcism, knew how to counteract their baneful influences, hence the extraordinary pantomime in which I had involuntarily played such an important part.

The frequent droughts to which these regions are subject in the summer months have given rise to a curious custom known as *amagoi*, or "praying for rain." Though it is also known in other parts of Japan, its most interesting forms are to be found here. On the east side of the range the practice is as follows: A party of hardy hunters, usually five or six in number, are sent as a deputation to the god supposed to dwell on the summit of Jonendake, one of the most imposing peaks in the whole chain. Armed with guns and primed with *saké* (rice beer), they climb to the top of the mountain and proceed to kindle a fire. By discharging their guns, rolling masses of rock down the cliffs, and otherwise making a din, they endeavour to attract the attention of the spirit



SHRINE ON SUMMIT OF ONTAKE, 10,000 FEET.

of the place to their prayers. By the noise and the flames they intend a mimic representation of the storm they are seeking, and the practice may be classed with those commonly known to folk-lorists as "sympathetic magic." The hunters who told me of the custom when I was myself on the summit, assured me that rain always comes within a few days after the ceremony. In another district, a party of villagers go in solemn procession to the bed of a mountain stream. They are headed by a priest, who leads a black dog destined for sacrifice. Arrived at the selected spot, the dog is tethered to a stone, and forthwith becomes the universal target for the bullets, arrows, and other missiles discharged by the assembled throng. As soon as the poor beast's life-blood is seen to stain the rocks, the peasants throw down their weapons and lift up their voices in

supplication to the *genius loci*, begging him to behold this defilement of his sacred precincts and to cleanse it in an immediate downpour of rain. In olden times it was the custom to use a horse, instead of a dog, as the offering. If rain was sought for, the colour of the animal must always be black, typical of the appearance of the rain-clouds desired. If fine weather was needed, the sacrifice must be one of spotless white.

As a rule, these great mountains, into whose wild fastnesses so few ever penetrate, seem to chiefly inspire people with dread. Sometimes, however, they are thought of with pleasure, and are approached in confidence and hope. For instance, to dream of far-famed Fujisan when adorned with her wintry robes of snow is the happiest of omens, especially if the vision includes two cranes and three egg-plants.

On Ontake, "the August peak," the southernmost giant of the Japanese Alps, a ceremony as weird as it is uncommon is annually practised by bands of a certain class of ascetic pilgrims called *gyōja*. As it is a fast-dying-out survival of a curious far Eastern representation of the Delphic Oracle, I will briefly describe it just as I have witnessed it on several occasions on the mountain, and also, by special invitation, at a private ceremony in one of the large inland towns. Its name is *kami-oroshi*, or "bringing down the gods," and it is practised by a number of pilgrims, from two or three to a dozen or so, under the guidance of a leader called the *sendachi*. Clothed in white garments, indicative of the purity of heart they desire, they ascend to the mountain-top. Here they believe there dwell beneficent spirits, who are ready, if approached with due fasting and sincerity of heart, to hear and to grant the petitions of the needy. The *sendachi* seats himself on the ground facing the rest, who are also seated in Indian file. The person next in front of the *sendachi* is called *nakaza*, or "medium," for it is he who acts as the channel of communication between the pilgrims and the spirits they desire to interview. The medium then takes between the palms of his outstretched hands a *gohei*. This is a stick of plain white wood with cut paper hanging from the top, and it is supposed, in Shinto temples, where it is always seen, to serve as a sort of seat for the presiding spirit of the place. With the *gohei* tightly held in his grasp, amidst the prayers and incantations of the pilgrim band, the medium throws himself into a sort of trance. His face turns a livid hue, his limbs grow stiff and rigid in catalepsy, but how it is done, only the initiated, like himself, really understand. Whilst in this state he is supposed to have lost his own personality, which is replaced by that of some god or other that has come to answer the questions of the worshippers. These are put by the *sendachi*, who acts as a master of ceremonies, and replies are given with orthodox oracular vagueness. Sometimes information is wanted about absent friends, future business prospects, the best means of curing a sickness, or the state of the weather for the next few days. When all

have been duly answered by the medium, in an unnaturally hollow voice, the *gohei* stick is suddenly jerked up in the air. This means that the god has now ascended, and that the *séance* is over. Prayers are again offered, with thanksgiving for the interview vouchsafed, and then



MOUNTAIN PILGRIM.

nothing remains but to pound the body and to knead the limbs of the medium till they resume their normal flexibility.

This curious practice, until the year I first visited the mountain, had never been witnessed by foreign travellers, and its existence seems never to have been suspected. Investigations prove it to be nothing

less than a strange survival of one of those forms of Hindu mysticism practised by the sect called the Yogacarya, which, after first finding their way into China, were introduced into Japan early in the ninth century. This was chiefly through the agency of Kobo Daishi or Kukai, the founder of the Shingon sect of Buddhists in Japan. Owing partly to the Government prohibitions, and to the spread of education and general enlightenment, these strange customs are dying a natural death, and will soon become buried in oblivion.

And so we bid farewell to the Alps of Japan. They do not, it is true, display the glories of glacier-shrouded peaks, and the scale on which they are built is only two-thirds that of the famous Alps of Switzerland. But the picturesqueness of their valleys and the magnificence of their forests surpass anything of the sort that I have seen in Alpine wanderings in Europe. Nor are their quiet solitudes yet invaded by the species of tourist with whom we are only too familiar, who rarely fails by his coarse vandalism to defile in one way or another the sanctuaries of nature, and of whom it may only too truly be said, "Nihil tetigit quod non contaminavit." And at least the Alps of Japan may claim to share with other scenes the enthusiastic eulogies of a great writer: "How many deep sources of delight are gathered into the compass of their glens and vales, and how, down to the most secret cluster of their far-away flowers, and the idlest leap of their straying streamlets, the whole heart of Nature seems thirsting to give, and still to give, shedding forth her everlasting beneficence with a profusion so patient, so passionate, that our utmost observance and thankfulness are but, at last, neglects of her nobleness, and apathy to her love!" (Ruskin, 'Modern Painters,' Book IV.).

Before the reading of the paper, the PRESIDENT said: We are assembled here this evening to hear Mr. Weston's description of that great range of mountains which Europeans have called the Japanese Alps. We had accounts, many years ago, of the provinces on either side of these mountains. Mr. Adams described to us the silk districts on the eastern side, and Mr. Troup communicated an account of his journey along the provinces on the western side, on the shores of the Sea of Japan, but we have never yet had a description of the mountain range itself. I therefore think that we may anticipate a geographical treat this evening from the account which Mr. Weston will give us of that range.

After the reading of the paper, the following discussion took place:—

The PRESIDENT: I think we have with us this evening one of the earliest travellers, I think the earliest English traveller, in the Japanese Alps. I hope Mr. Gowland will address the meeting.

Mr. W. GOWLAND: I have listened with very great interest to the excellent paper of my friend Mr. Weston. It is now twenty-two years ago since I first began to explore this range, about which he has told us so much, and, from my knowledge of the range itself, can fully confirm the accuracy of all his observations. I am extremely pleased to find that so experienced a mountaineer as Mr. Weston has taken up the exploration of these magnificent mountains, and carried it forward so very successfully. I am afraid, after his paper, anything I may say will fall rather

flat, because the few remarks I am going to make consist of somewhat dry details, relating more particularly to the minerals, plants, and industries of the range.

In 1873, in conjunction with my then colleague, Edward Dillon, I started to explore the southern part of the range; but that year we were only able to make the ascent of Ontake. Two years later, going to the northern end, we ascended Tateyama, and, nearly following the route Mr. Weston described, we ascended Yakeyama, a very interesting volcano 7600 feet high, and passed down the western side of the range. In subsequent years, from time to time, I made the ascent of several peaks, notably Yarigadake, Jiidake, Gorokudake, and Norikura, none of which had been previously ascended. I saw the peaks Mr. Weston described, and am very glad to find he has conquered them. In fact, there are very few high peaks averaging 10,000 feet which either he or I have not ascended. Now, to the geologist, the mineralogist, and the botanist, the range has very great interest indeed. Mr. Weston has described briefly its geological features, and I think about that I must not say more, but undoubtedly the range is of very ancient date; doubtless it dates from Palæozoic times, and then consisted chiefly of granite and crystalline schists. Since that time, the cones of Norikura, Ontake, Tateyama, and several others have been formed. Still there are some old granite peaks remaining, not so high as the later volcanic peaks, but still between 8000 and 9000 feet. I may say that the oldest peak is, I think, Yarigatake, which consists of very hard ancient porphyry breccia. The youngest peaks lie at the north-east, and consist of three very fine volcanoes of a very much later date than any others.

For the mineralogist there are many interesting places, especially in the neighbourhood of Tateyama. Near the base of Tateyama there have been very extensive beds of limestone. These, by metamorphic action, have been converted into highly crystalline marble; and in this there is a remarkable combination of minerals,* which, I think, does not exist anywhere else, except in one other part of the range, and at Ishiyama, at the south-eastern extremity of Lake Biwa. There are several other parts of the range where we find garnets and many other minerals I need not name. Its chief value is on account of the ores found in it. I have made a special exploration of the ore-bearing districts, and from Mr. Weston's paper, I find there is a mine which must have been very much developed since I visited it. When I was there there were only four men working at the place. On the west side of the range, near a place called Funatsu, we have very extensive and valuable ore deposits of argentiferous galena and copper pyrites, and several mines, in one of which, fifteen years ago, I found no less than 750 men working, and the annual product during 1890 amounted to 140 tons of copper, 170 tons of lead, £18,500 worth of silver from all the mines in the district. Further, we find extensive deposits of plumbago, of which, in 1890, 4500 tons were extracted. Passing northwards, we have manganese. Then, going round to the eastern side, we have deposits of silicious shale, very rich in petroleum, but they do not yield so much as they ought to do if worked by more modern processes: then, still further down the range, at Kurodake, there are extensive deposits of iron ore, but, unfortunately, in such an inaccessible position that I am afraid it will be many, many years before the Japanese can utilize them for the manufacture of iron. In order to get to them from the east side, you have to cross over the front range, varying from 5000 to 7000 feet high. Then we have, of course, sulphur on all the volcanic peaks. In the river which flows down the eastern side of the plain of Shinano, I found asbestos derived from the tributary ranges, and it is curious that in very early days this asbestos was worked, and fire-proof paper made from it. Then of the

* The minerals embedded are: graphite, wollastonite, magnesia-mica, and actinolite.

hot springs I will only mention four. Hirayu consists of hot water, the temperature being 184° Fahr. Two other famous springs (Shirahoneyu and Norikurayu) contain calcium sulphides, the temperature of the former being 128° Fahr. The solfataras of Tateyama have extremely strong mineral water, very much stronger than any other; it consists of a solution of alum, and contains free sulphuric acid. The temperature of the water is near the boiling-point.

Now with regard to the flora. This is rich, varying from sub-arctic to temperate, making it one of the finest fields for the study of Japanese botany. The plants represented are most varied owing to the range in altitude, and I shall be glad to supply a list of the most important to the Society if they care to have it. With regard to economic botany, my researches bear out what Mr. Weston has said with regard to climatic conditions. On the west the vegetation is not nearly so luxuriant as on the east. On the east, I found rice growing up to 4000 feet, ordinary potatoes to the same height, barley to about 4200 feet, buckwheat to about 5000 feet.

Besides the interesting minerals, ores, and flora, there are some very important archæological remains on the plains and the low hills on the eastern side. Towards the north-east end of the Shinano plain, there are dug up from time to time stone arrow-heads and stone axes of such a form that we must conclude that at a very early period indeed that part of the country was inhabited by the aboriginal Ainos. If we come further south in the plain, we find a most interesting series of dolmens and chambered tumuli. Near the town of Nagano, there are a great many in a ruined state; but at Matsushiro I found eight in fairly good preservation, of four of which I took measurements. They consist of rude rectangular chambers of stone, the length of which varies from 14 to 18 feet, the breadth is about 7 feet, and the height about 8 feet. Two of them are megalithic; they are constructed of very large stones, and are entered by a narrow gallery 4 feet in width, the entrance facing south within a few degrees. The remains found in them consisted of iron swords of the dolmen period, and bronze rings plated with gold, besides a considerable quantity of sepulchral pottery. Remains, absolutely the same as these, I have found in my explorations of the great dolmen districts in the centre of Japan, and they show distinctly that these dolmens are of approximate age with those of the Central Provinces; therefore not later than the fifth century, and probably much earlier, that part of the plain of Shinano was occupied by the Japanese, and not by the aborigines.

I am afraid I have exhausted my time, but I must say one word about the other mountains, which I should advise all travellers to visit. I have been in the neighbourhood of all, and have ascended some; one of the first in the north-east of Japan, Chokaisan, is one of the most beautifully formed volcanoes in the country, 6800 feet high. Further south we come to the magnificent group of mountains round Nikko. South of Shinano, we have a grand mass of mountains, round which I have been, though I have never ascended them. The peaks are quite as high, or nearly as high, as the Shinano range, and they are practically unexplored. Going still further west, we have a magnificent mountain mass in Southern Yamato and Northern Kiishu, not quite so high as the Shinano-Hida range, but for a sportsman they form a magnificent hunting-ground. The bears are numerous, and a kind of chamois (the goat-faced antelope, *Nemorhedus crispus*) and boars are so abundant that in all the valleys leading up to the mountains, wherever there are fields, there have to be stockades placed in order to prevent them from destroying the crops. Still further westward we have the very fine volcano of Daisen, which I have been round, but have not ascended. Still further, we have one or two magnificent mountain groups in Kiushu. Now, in all

these the Alpine climber will not find glaciers, and where snow-slopes are found, there is no difficulty in dealing with them; but everywhere the scenery is wild and grand, and if a spice of danger is necessary to tempt him to visit these glorious mountains, he will have no reason to complain if he attempts to scale some of their highest pinnacles, or to descend into some of their craters.

Professor MILNE: At the present moment I am being weaned from Japan, a country of gentle manners and artistic instincts; I have already experienced two or three months of the process, but when I saw Mr. Weston's pictures, I felt that the weaning had been useless. Now I am trying to find a few friends who will believe what I tell them about Japan. I believe everything Mr. Weston said, because I know it to be true. One of the things that struck me when I reached that country was the wonderful clearness of the atmosphere at certain seasons of the year. I had been brought up in a town that received the smoke from two counties. When the wind was westwards it blew from Lancashire, when it was eastwards it blew from Yorkshire. Thus it was always smoky, except perhaps once or twice a year, when we could see for about 7 miles. In Japan, however, I could see Fuji rising up 12,400 feet, at a distance of 70 miles. I was so surprised that I wrote home to my mother, "I can see mountains at a distance of 70 miles." My mother replied, "Dear John, your eyesight must have wonderfully improved." The next thing that I noticed was the beautiful form of Fuji. This so struck me that I photographed it from twenty-six points of view. The analysis of the curves showed that they were mathematically as true as circles and parabolas. The meaning of this volcanic curve is that the base of the mountain is just sufficient to support the material above it, and if you wanted to increase the height of the mountain you would have to increase the size of the base. Given the shape of the mountain, you can tell something of the nature of the material it is composed of, and this is one of the lessons which have been learned from Japanese mountains.

The material out of which Fuji is built, as determined from its shape, has a strength equal to that of ordinary brickwork. Once I slept on the top for over a week. From observations made with pendulums, it seemed that the mountain heeled over by the wind. This heeling was equal to that which would be produced by a wind pressure of 50 lbs. per square foot if a mountain like Fuji was made of brick. We also made observations with barometers, thermometers, and hygrometers, at intervals of two hours, and used this material, together with observations made at the base of the mountain, to determine its height. One result we obtained was that from the same data you will get a different height by different methods of calculation. One man levelled Fuji from the bottom to the top, making the height 12,365 feet—an easy number to remember, because there are 12 months and 365 days in a year. One conclusion I come to is, that we are not certain about the exact height of any mountain. Changes in barometrical pressure may cause mountains to vary in height. They may swing from side to side with diurnal waves; they may shiver and tremble in a tremor-storm; while at the time of an earthquake they may wag their heads and dance.

The PRESIDENT: I think we have been very fortunate this evening, both as regards the paper and the discussion. Mr. Gowland has given us a most interesting account of the metalliferous aspect of the range of mountains and of their archæology. Professor Milne, too, has supplied us with much matter for reflection. I really think that these slides are among the most beautiful we have ever seen in this room. I am told by Mr. Weston that they were nearly all executed in Japan. I do not know whether the meeting would like to see a few more, but I am sure you will all pass a very hearty vote of thanks to Mr. Weston for his most interesting paper, and for the splendid illustrations which accompanied it.

NOTES ON A JOURNEY IN TARHUNA AND GHARIAN, TRIPOLI.*

By H. S. COWPER, F.S.A.

THE Tripolitan range of hills, through which I was enabled to make a brief but highly interesting journey in March and April, 1895, is probably as little known as any piece of inhabitable country, equally close to the sea, in the whole of the Mediterranean coast of Africa; and this is rendered more remarkable by the fact that a large part of the district is full of remains of a primitive and quite uninvestigated civilization. It is, of course, the fact that many of the earlier explorers passed through these hills on their ways to the Sudan; but with the exception of Barth, who made a journey through them from end to end, they all appear to have passed quickly through them by the caravan routes, without diverging to examine what is probably, from an archæological point of view, one of the most interesting portions of North Africa.

The reasons for this neglect during the last decade are more obvious, for since about 1880 the Turkish authorities have placed every obstacle in the way of European travellers entering the country, and this prohibition has been rigidly enforced. I trust, therefore, that a brief account of my ride will not be altogether unacceptable. My objects being purely archæological, I resolved to make my way first to the Tarhuna district at the eastern end of the range, where both Barth and Von Bary had noticed briefly the existence of a few megalithic structures, and accordingly I engaged a guide who was a native of that locality.

I left Tripoli on March 21, and followed a south-easterly course, through the palm groves which fringe the coast, until we passed south of Tajura, where the plain is studded with lime-burning kilns (called *kushi*), the heavy black smoke from which can be seen for miles across the plain. The road then led past a small grove of palms with the tomb of Meiabut Si Abd el Karim, and out on to a plain, where we camped.

The country between the coast and the hills is thus divided: (1) the palm groves on the coast; (2) a strip of partly cultivated plain; (3) a strip of sandy desert of varying width; (4) the lower slopes of Tarhuna, consisting of gently rising, undulating country, averaging about 550 feet above sea-level; (5) the Tarhuna hills.

The desert strip consists of wave-like ridges of blown sand, so light and dusty that the crossing of it in a hot gibleh wind is by no means pleasant. Here and there the sand is blown clear and discloses a hard surface, often covered with shreds of pottery, mostly Roman, and rudely worked flints. These ancient sites are numerous.

The most important feature on this part of the road is the Wadi

* Map, p. 228.

Raml, which I struck about noon on the second day. This watercourse, about 300 yards wide, runs here north-east through the desert of shifting sand, and at this time of year still contained a rill of running



THE WATERCOURSE OF WADI DOGA, NEAR KASR FASGHA, LOOKING NORTH-WEST.

water. At the point I struck it, it is met by the Wadi Saghia, coming from the hills further east.



WADI DOGA NEAR KASR DOGA, LOOKING NORTH.

The lower slope of Tarhuna, where I camped on the second night, is of varying character, planted with corn in patches, and covered in other places with scrub and *deese* grass. Here and there are great

yellow blotches in the landscape, which are blown sand, on which nothing will grow. The Tarhuna hills rise on the south side like a wall, showing but few prominent elevations.

On the third morning I entered early by the Fum Doga, *i.e.* the mouth of Wadi Doga, or place where the valley passes from the hills to the plain.

Although Kasr Doga, at the southern end of this important wadi, has been visited by Barth, and perhaps others, the fine wadi itself, with its wonderful remains, have not apparently been hitherto visited by a European.

Passing through Fum Doga, we entered the wadi and wound up on to a beautiful plateau, green and with a good deal of cultivation. This plain varies between 700 and 900 feet above sea-level, and on either side rise hills varying from about 1000 feet at the mouth to about 1700 feet near the head of the valley. The principal ones, flanking the valley at its entrance, being Jebel Ahmar and Jebel Areif. Through the plateau runs the watercourse—a ravine averaging about 150 feet in depth, of tortuous course and stony bed.

The chief part of the day was spent examining and photographing the numerous ancient sites in the valley. In every direction could be seen great standing trilithons, ruined or complete, single or in rows Lines of massive walling enclosing square areas, great altar stones, Roman capitals, cemented baths, and ruined structures were to be found on almost every hillock rising from the valley.*

Night compelled me to reach Kasr Doga at the head of the valley by a short cut over Jebel Arva, instead of by the tortuous course of the wadi. The ascent was very steep and rough, and hard for camels. On reaching the summit, I found we were about 1750 feet above sea-level, and nearly 1000 above the valley we had left. It was, however, too dark to see but faintly the wave-like crests of the surrounding hills, and the Wadi Guman, which stretched away from our feet towards the sea, and the district called Targut. On the top we found ourselves on another plain, with fields and fenced gardens and a few figs. In some of the rougher places the air was sweet with wild thyme and other sweet-smelling plants. The descent to Kasr Doga was less steep, and we encamped under the great Roman tomb mentioned by Barth.

To the south-east of Kasr Doga, which is the head of Wadi Doga, spreads an undulating plain of great extent, which I shall call the Tarhuna plateau. Here I spent two days, camping with the family of my guide, and examining the senams or megalithic temples, the ruins of which are to be found on every point. The plateau averages about 1250 feet above the sea-level, and is therefore lower by some 500 or 600 feet than many of the hills on its north side, through which are cut

* The inhabitants of all this part of Doga are called M'Saaba.

Wadi Doga and other wadis. The most important of these appear to be Wadi el Menshi on the north-east, and Wadi Daun and the Kseia on the east. To the south-east and south the plateau bears the name of Ferjana (though it is still in Tarhuna), and appears to shelve away into broken country, beyond which are Beni Ulid and Wadi Sufejin. The greatest width of the plain from Wadi Daun on the east to Jebel Jumma on the west near the Gharian district is about 25 miles.

The Tarhunis or Arabs inhabiting the district appear to be a race of pure-bred Arabs. In fact, I saw no traces of negro blood among the people in these hills. They are all tent-dwellers, or troglodytes, and,



SENAM AT KOM ES LAS, TARHUNA.

with the exception of the one or two points where a small Turkish garrison is maintained, there is not a built house in the district. None of the Tarhunis are, however, nomads, but they are divided into tribes, and the chief feature is the patriarchal system of living together by families. Thus my guide, one of a race of merabuts or saints, and the head of his family, lived with his brothers and sons and their respective families all in one line of tents. These are, however, only their winter quarters, and in the hot weather they go into tiny huts built of wattle-work, which are dotted about independently among the crops. At every encampment there are a number of ferocious dogs, which render it really

dangerous for the stranger to venture from his tent at night. These animals lie round the camp, and savagely attack every one who approaches, even an inhabitant of the camp, who would certainly be badly bitten if he did not carry and use a heavy stick. The Tarhunis are handsome, tall people, and all wear the white barracan or kholi, which is common in all Tripoli. Every man carries a long flint-lock gun, without which he never moves ten yards, although it is seldom used. Pistols are sometimes worn, but the sword is not seen.

In the camp a certain amount of order and cleanliness is always maintained. In that of my guide, a Mueddin chanted the call to prayer as regularly as is done in the town. The Tarhunis, indeed, seem punctilious as regards the forms of their faith, and many are regular observers of the hours of prayer. It was Ramadan when I was travelling, and, although the faithful are exempted from observing the fast when on a journey, nothing would induce my men to touch food between sunrise and sunset. They did not consider a fortnight's excursion in their own country a journey.

The Tarhunis, unlike many nomadic tent-dwelling Arabs, rigidly hide their women from view, and I never saw, during my ride, any woman (except one very ancient dame) nearer than about 300 yards.

The underground houses are a few chambers dug out below the level of the field in the earth. Some are inhabited all the year round, but others are only resorted to in very hot weather.

The food of the Tarhuni is chiefly bazine and cuscus, both made of flour, the latter often very nice, and the former very nasty. Bread is but little baked, and what there is is unpalatable.

The occupation of the Tarhuni is agriculture and stock-raising. On the plain are pretty little fenced enclosures called henshirs, in which are grown wheat, barley, and a few figs. The flocks are cattle, sheep, and camels; horses are not common. Trees are almost unknown, and a solitary "batum" of magnificent dimensions is known as El Khadra, "the green," and is commonly named as the only tree in Tarhuna. There are, however, some in the hills on the west near Gharian.

For water the people are dependent on the winter rains and the supply thus formed in the deep wells scattered over the plain. It is manifest that in former days the country maintained a large and industrious population, so that a great change in climate, and consequently in water-supply, has at some date taken place.

Though living within a few days of the coast, the Tarhuni knows little or nothing of European civilization, and their curiosity and amazement at such things as a pocket-knife with several blades, a compass, or a camera tripod was very amusing. On showing a party of them the reflection of a large trilithon in the finder of my camera, I was asked whether the image seen was the structure before us or one I had taken the day before.

In Tarhuna there is one mosque, Jamah Sheikh al Madeni, where probably they bury some of their dead, although I cannot be certain of this, as I did not get an opportunity to visit it. Often, however, they bury on the hilltops near their tents, and many of the tombs of the merabuts are nothing more than rude cairns or circles of stones.

After spending two days riding from ruin to ruin, photographing, sketching, and measuring, I marched south-east to Kasr Zuguseh, in the Ferjana plain, where, in the walls of a small stronghold, I discovered some sculptures of Phallic subjects, accompanied by a Roman inscription. Four watercourses were passed on this day before arriving at



KASR ZUGUSEH (FERJANA DISTRICT), WITH CARVED STONE.

Zuguseh, namely, Wadis al Menshi, el War, el Uftah, and Hallak Shakir. Pitching my tent, I at once rode off to the south-east, where I found the ancient sites certainly better preserved than in the more northern part of the plain, and equally numerous. In fact, wherever one looked across the plain one's eye met, either near or far, a standing senam or the upright posts of one capping the hills.

It had now become evident that it was impossible to visit anything like all the sites, and it would be more useful to ascertain, if possible, the geographical limits east and west. Accordingly, on the morning of the 27th, after a wet and squally night, I turned north-east and directed

my steps towards Jebel Msid and the Wadi Kseia, where Barth had noticed already some remains. Leaving the plain, we passed down a narrow and stony but picturesque wadi called Shaahbet el Khel, crossed at frequent intervals by massive Roman walls, evidently used for damming the water. This runs into the wide and more important Wadi Daun (called by Barth Dawan), which runs east and west, considerably below the level of the Tarhuna plateau. On the north side, and nearly opposite Shaahbet el Khel, is another tributary wadi called Kurmet al Hatheia, which runs north-east and comes out into the Kseia plain.

Like Shaahbet el Khel, both Wadi Daun and Kurmet el Hatheia have the Roman dam-like walls built across them at frequent intervals, those in Daun being continued to the west until the wadi loses itself on the plain. Besides these, in the wider part of Daun, which is between a quarter and half a mile across, there is the ancient fortress called Kasr Daun, situated on the left bank of the stream, and innumerable relics of Roman and perhaps earlier date.

Leaving Daun, we entered Kurmet el Hatheia, and about a mile's ride brought us out into the beautiful valley called Kseia. Here the scenery varied much from the barren plateau, the hills round it giving a more sheltered and homelike appearance, which was added to by an occasional tree. Away to the north-east, at the end of the valley, stood out Jebel Msid, easily recognizable by its rounded form and the small ruined building which caps its summit. In the middle of the valley I found the trilithon engraved by Barth in his book of travels. Others, some of them very remarkable, exist due south from here, and also at the base of Jebel Msid.

On arriving at the foot of the mountain, I saw a crowd of women standing before a line of tents, and uttering the strange mournful cry for the dead. A man had died some time before, but the ceremony had been postponed till the end of Ramadan. The valley at the foot of Msid I found to be about 800 feet above the sea, and the summit of Msid about 1450 feet, and therefore lower than some of the points about Doga.

From the summit a magnificent view lay before us. To the north-east lay Kusabat, appearing like three villages set in palm groves, and distant about 7 miles. This was the only glimpse I got of anything like a village while I was in the hills, for I did not approach the one or two places where soldiers were quartered. Between Msid and Kusabat lay Wadi Uani, which joins Wadi Kseia south of Msid, and they run together to Targelat. Strange to say, neither of these important wadis appear on any map I know. In all other directions nothing but range after range of low hills, all of similar elevation, except to the south, where they died out in lower ranges towards the Beni Ulid country—a view somewhat monotonous, but charming from its sense of air and freedom, and in some ways from its utter desolation.

Kasr Msid, the ruined building on the top, appears to have been a

small Muslim monastery, or something of the sort, for beneath the building is a tiny vaulted mosque. In this building, which is now disused, there is some curious plaster decoration on the roof close to



ROMAN WALL (DAM?) IN WADI DAUN.

the "mihrab," amongst which is a human hand in relief—a curious subject for a Mohammedan mosque.



SENAM BU MATIRAH IN WADI KSEIA.

Having examined the senams of Kseia, and my men informing me that there were but few, if any, others further east, I decided to march

straight to the western end of Tarhuna, and then, by returning to Tripoli through Gharian, I hoped to ascertain if the series extended in that direction. Accordingly on the 28th I returned by Wadi Daun, which I followed up till I came out on the plain near Kasr Zuguseh, and camped at Kom es Las, on the Tarhuna plateau.

From Kom es Las the Tarhuna plateau is an almost level and nearly waterless plain, which stretches west for nearly 20 miles. Then comes a country mountainous in character, but of no very great elevation. The eastern part of these hills are also in Tarhuna, and then Gharian is reached.

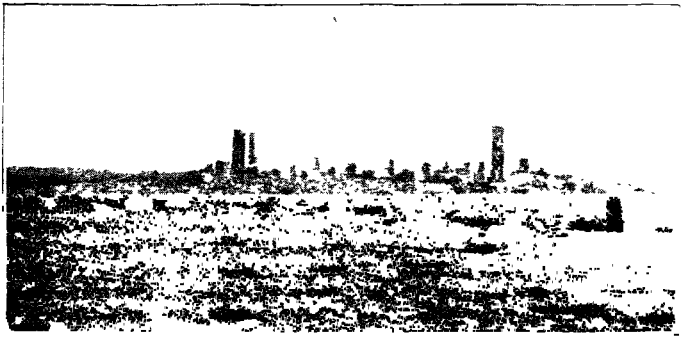
A nine hours' weary journey in a hot gibleh wind, without a well on the road, brought us to the base of the hills. The aneroid showed that the plain descends about 100 feet from Kom es Las to its western extremity.

The remaining days of my ride were neither so profitable nor so pleasant as the earlier part. The senams were few and far between, and from March 29 to April 2 it blew a gibleh wind of such force that we all suffered exceedingly. On the first day a camel-man fell out with slight sunstroke, and on the ensuing days the heat was so great that the films in my camera warped and the machinery stuck, my books and maps curled up with the dry heat, and sticks of sealing-wax in my baggage became flat like cardboard. The air was charged with electricity, so that every time I moved the wool of my white burnus crackled distinctly. Sleep at night was impossible, for the wind threatened every minute to blow down the tents.

We entered the western Tarhuna hills by a picturesque pass between Jebel Jumma and Ras el Aswad, which appear to be about 300 feet above the pass-level, and therefore about 1900 feet above the sea. Here we entered on a country of a totally new character to all we had seen—a broken hilly district intersected by frequent wadis and watercourses running north and south. First we struck Wadi Hammam, a watercourse behind Jebel Jumma, with stagnant pools of water. Then we came to a lesser ravine, Shaahbet al Zeraghwanieh, where some small batum trees formed a most welcome shelter. After that we camped at Wadi Wif, a beautiful fertile valley with a few batum trees and patches of corn lying in the heart of the desolate hills, but not a tent in sight.

Immediately west of Wadi Wif is the boundary between the districts of Tarhuna and Gharian, the most important place in the last being Kasr Gharian, where a Turkish military post of some strength is always maintained. Gharian (at any rate the eastern part of it, which I traversed) is very different in character from Tarhuna, being more truly mountainous, and, I should say, less thickly populated. The Gharianis, like the Tarhunis, live in tents (gitûn) and underground dwellings, and have the reputation of being richer than the Tarhunis, who, for some hardly explainable reason, are considered the poorest and

unluckiest of the hill-men of the Tripoli chain. As long as I was in Tarhuna I experienced nothing but courtesy and hospitality from the people, which was doubtless due to my travelling with a Tarhuni of a respected and even holy family; but as soon as I entered Gharian



SENAM EL MGAGERAH, WESTERN TARHUNA.

things changed. My retainers insisted on my bundling myself up in burnus and tarbush whenever we approached tents, and the inhospitable character of the natives was shown at Wadi el Ghan, where the people refused to sell us either provender for our cattle or food for ourselves.



JEBEL JUMMA.

My route from Wadi Wif lay west and north-west through the hills of Gharian. The chief features in this part of Gharian are the wide and important wadis intersecting the hills and running north towards

the sea, and the range of hills lying west of Wadi Wif called Kushiteh Gamatah. The most important wadis are Wadi Bir el War, a large stony watercourse, dry at this time of year; Wadi Gethathet Dum, a little beyond which is another, the name of which I failed to obtain; and, lastly, Wadi el Ghan, eight hours distant from Wadi Wif. where, to my delight, we found a stream of running water. This wadi at this point is some four or five hours from the Kasr, and is, in fact, the southern prolongation of the great Wadi Haera or el Jair, which runs right out on to the plain some 8 or 10 miles west of Wadi Mejenin.

Arabs, like animals, have an extraordinary objection to running water, and search for a stagnant pool of putrid water rather than drink of a flowing stream; and here I had my only altercation with my retainers, who objected to camp at Wadi el Ghan on the score of unwholesome water, and the plea that the place was on the high-road to Gharian, and infested with thieves.

We appeared, however, to have now got out of the district of the senams, and the intolerable heat decided me on following the wadi direct to Tripoli instead of approaching nearer to the Kasr, by which nothing could be gained, and could only run my men into possible difficulties with the authorities.

The country passed through between Wadi Wif, and Wadi el Ghan is cut up into many points, among which the traveller winds on his road to Gharian. There are no wide plains as in Tarhuna, and the track leads through the hills at an elevation of 1400 to 1600 feet, while the hilltops appear to be some 500 feet higher. Though my men could hear of no megalithic ruins of the senam type, some of the eminences are capped with crumbling buildings which may well be Roman. On the lower ground a good deal of corn is planted, and halfa grass is plentiful. Thorns (sidra) are fairly numerous.

Wadi el Ghan, through which I commenced my return journey on the afternoon of April 1, is so beautiful that I felt no regret at having climbed no further over the barren hills towards Gharian, although the scenery, indeed, was somewhat spoiled by the sickly haze which hung over all after the prolonged gibleh wind. This important wadi is, indeed, with its lower prolongation of Wadi Haera, a regular caravan route from Tripoli to this part of Gharian. First we clambered along the rocky bed of the watercourse, which for some distance was a conglomerate of large stones, but lower down becomes limestone; and in one place a fine section can be seen where the latter overlaps the former. Further down the wadi runs between grand cliffs of limestone and sandstone, which in places were dark red with iron ore. In the rough bed of the ravine were stagnant pools with reeds, but running water we found none after getting some distance from the camp. There was life, too, in this wild valley. Droves of camels came trudging along, with their dusky, lean-limbed owners nodding on their backs or slouching at

their heels. At one corner a party of wild, half-naked lads and lasses dashed screaming and laughing from some game, and, hiding behind reeds and rocks, stared with great black, wonderstruck eyes at the



SHAAHBET EL ZERAGHWANIEH.

apparition of the white skin invading their playground. Then a mile of unbroken solitude, and another corner, and before us stood by a rock



ISOLATED HILLS ON THE PLAIN NEAR MOUTH OF WADI HAIRA.

two tall white-robed Arabs like statues, with their bleating charges round them.

Three hours' ride from our camp the wadi emerges from the cliffs and becomes a watercourse running through cultivated pastures, which extend up to the bases of the hills.

From here I travelled, partly by day and partly by night, direct to Tripoli, which I reached at midday on April 3. After leaving the Gharian hills, the route lay over a green semi-cultivated plain similar to that crossed before entering Doga, but more level and of greater extent. In all we marched about eleven hours across this plain before we struck the desert patch, and by my aneroid I found that it shelved gently from about 600 feet to about 150 feet above sea-level. Our direction was generally north-north-east and north-east. The most interesting features on this plain are the three isolated hills lying on the plain like islands just outside the place we left the hills. These my men called Battus, M'dawar, and Mamureh, and insisted that the names were interchangeable, and it did not matter which was which.*

At the same point we could see the hills we had left, receding in a long continuous range till lost in the haze down towards Fum Doga. A headland which appears to project furthest of all towards Tripoli is called Kashi Maruf.

At Bir el Sbeia our route dropped into the wide and fertile Wadi Mejenin, by far the richest and best-cultivated country we had seen in Tripoli. Four hours beyond this we entered the desert patch which cuts off the capital from the rest of the country on the landward side. Here we left our camels to follow, and four hours at horse pace brought us to the gates of Tripoli.†

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* On Barth's map I find these called Bates, Smaera, and Gedaea. It should be noted that my information here was from Tarhuni men, who did not know this district very well.

† I submitted a sample of the red iron deposit of Wadi Haera to Mr. F. W. Rudler, of the museum of practical geology, who has favoured me with the following report: "The red material seems to be an ochreous clay. The colouring matter is of course red oxide of iron, in the shape of soft red hæmatite or 'reddle.' The material would probably form, when ground, a pigment or ochre of good colour. But to be of any economic importance it must occur in quantity."

NOTES ON MR. COWPER'S MAP.—The map accompanying this paper, with the exception of the coast, the direct route to Kasr Beni Ulid (indicated faintly) and the positions of Kasr Doga (32° 32′ N., 13° 40′ E.) and Kussabat (32° 35′ 30″ N., 13° 58′ E.), determined by Admiral Smyth, is based upon a compass survey by the author.

In several instances bearings taken on a point from two stations proved evidently erroneous. This must be attributed to the fact that the Tarhuna hills are of very equal elevation, and without striking points, and this feature evidently misled the guide in pointing out hills by their names.

The following bearings (among others) have been utilized in plotting the survey:—

1. From a point north-west of the camp of March 22: Kasr Jafara, 69°; hill east of the mouth of Wadi Doga (J. Ahmar), 148°; Jebel Kashi Maruf, 235°.

2. From Senam Kasr Doga: Kasr or Jebel Bu Tawil, 292°; Kasr Doga, 242°; Kom es Las, 175°.

3. From Ras el Id: Bu Tawil, 308°; Ras el Doga, 328°; Kom es Las, 205°.
4. From Kom es Las: Ras el Id, 24°; Kasr Doga, 347°; Jebel Thubain, 223°.
5. From Jebel Msid: Kussabat, 51°.
6. From camp, March 29: Kom es Las, 64°; Jebel Jumma, 230°; Bu Tawil, 37°; Jebel Thubain, 188°.
7. April 2, from a point marked "600": Thaniet Bu Ghelan, 236°; Nuebat mta Ergaat, 170°.
8. April 2, from a point near J. Battus. "450": El Nuebat mta Ergaat, 182°.
9. April 3, from camp north of Bir Sbeia: mouth ("Fum") of Wadi Doga, 103°; Kashi Maruf, 123°; Thaniet Bu Ghelan, 211°.

The altitudes inserted are from aneroid readings.

JOURNEYS IN PERSIA (1890–91).*

By Captain H. B. VAUGHAN. 7th Bengal Infantry.

We found the Kal-Mura river full of water, and flowing rapidly into the salt desert close by. It was crossed with some little difficulty, but as we had camels with us, we transferred the mule-loads to their backs, and got them over dry.

During the next long march the baggage took one road and we took another. We found our way in the dark, but no baggage turned up until midnight, and for several hours we employed ourselves in lighting bonfires and firing shots to attract them to the spring at Serai-Bunab, the rendezvous settled upon. Shortly after this we arrived at Turut, where I found some former acquaintances. From Turut, where I picked up my former guide, we marched by a new route to Husen-Nun, and, still skirting the *kavir*, we passed a village (Paistun) on the road.

Husen-Nun is a small village within sight of the large town of Reshm, and it is here that the road across the *kavir* from Jandak first reaches *terra firma*. A few date palms grow in the place, and it is within a mile of this place, but to the west, where the Gugird range commences in a few low hills.

The road soon ran between the desert and the foot of the Kuh-i-Chashma-o-Chah-Shirin, or hill of fresh-water wells and springs; then we passed the Kuh-Didawan, where in former days a look-out was always stationed to observe and signal Turcoman raiding-parties, who were very fond of going by forced marches through these inhospitable wilds and making a sudden descent on some town, which, by reason of its distance from the frontier, imagined itself secure. Large blocks of stone, very dense and hard, and of a brilliant red and yellow, cumbered the ground, besides many others, which were found by a geologist to be impure jaspar and flesh-red gypsum. After going 36½ miles we reached a small well, the Chah-Shirin. Next day we passed through the most fantastic scenery, passing hills of vivid green and red and

* Map, p. 124. Continued from the January number.

yellow, or sometimes found all three combined in one hill in sucessive layers. 3. The road wound up and down, passing through gorges and under rugged cliffs of fantastic shapes, often pierced with arches and having numerous pinnacles. It all looked so extraordinary with its exaggerated colouring that it resembled a dream, and looked as if it only wanted a dragon to complete it. After going 34 miles we reached a village within sight of Samnan, a well-known town on the high-road. Here I met an old friend in whose house I had previously stayed for three weeks. I gave him a watch which wound itself up as one walked along, with which he was vastly pleased, and presented me in return with a long piece of Persian woollen material called "pushmin" and other things.

At Teheran I was sorry to part with Captain Burton, who had been my travelling companion for the past four months, and without whose valuable help it would have been impossible to have covered so much ground satisfactorily in so short a time. His road lay homewards through Europe, and mine was back to India by the Persian Gulf. At Teheran I met Mr. C. E. Biddulph, of the Indian Civil Service, and together we journeyed from Teheran to Isfahan by a route through the desert, which he has already described in a paper communicated to and published by this Society; and as his description of the journey is very much the same as what my own would be, I will content myself by referring only to those points of interest which came under my observation. After leaving Karim-Kaneh on the fourth day, the southernmost village on the north side of the desert, we crossed a small salt stream draining east, and on the *kavir*, it was about 30 yards broad, and is, I have no doubt, the same stream I crossed in 1888 to the east of the Siah-Kuh, and there called the Shut (salt-water river), which was also flowing east into the principal bed of the *kavir* lying between Reshm and Jandak. About 12 miles further on there was so much ironstone in the hills that the compass became quite unreliable, and interpolation by the plane-table was resorted to. We also saw, or imagined we saw, from the Siah-Kuh a causeway several miles in length, which was built to cross the swamp between it and Kishlak by Shah Abbas.

The next point of interest was the Daria-i-Nimak, a solid sheet of rock salt of varying, but in places doubtless immense, thickness. Its area we estimated at 440 square miles, and its elevation was 2700 feet, so that it is higher than the central desert, but does not drain into it unless covered with water to a sufficient height, and then only by a shallow watercourse a few feet broad. I crossed such a watercourse in 1888, south of the Kuh-Tulha, but as it was misty, I could not ascertain for certain whether this was the case. All I could make sure of was that there was rising ground to the west, so it is quite possible that the chain of low hills seen south of the Siah-Kuh completely divides the two deserts. A sample of this salt, tested by the chemical examiner to the

Punjab, was found to be practically pure sodium chloride, with no insoluble residue. Very small traces of sulphate were found, lime was absent, and magnesia was found only in small quantities, and it was suitable for dietetic purposes.

The following rivers are said to contribute to the adjacent salt lake, which washes the western termination of the salt :—

1. Rud-Khana-i-Kinaragird.
2. Rud-Khana-i-Zir-i-Hassanabad.

Both these are, I think, branches of the Rud-Khana-i-Shur river, and must pass north of the lake of the Hauz-i-Sultan-Kavir into the Daria-i-Nimak, if that is really their termination. This information was given me by my guide, who also said that the Kom and Pul-i-Dalak rivers also contributed to the Daria-i-Nimak, which was evidently incorrect, as they flow into the Hauz-i-Sultan-Kavir. Mr. Biddulph, who was my fellow-traveller on this occasion, and saw both the lakes on his return journey to Tehran from Kashan by the high-road, says that they are quite separate. If, however, it is true, as reported, that the waters of the Hauz-i-Sultan-Kavir are still rising, it is just possible that they may yet unite.

After crossing the salt, over which our route lay for a good 24 or 25 miles, a great number of sandhills were met with, which extend close up to Kashan, and back and again eastward to the Kuh-Yak-Ab (ice-water mountain). I had now travelled all round the Dasht-i-Kavir, and twice passed along its northern and western border, and am therefore enabled to give a fairly good idea of its general geography, of which a short summary may not be out of place.

The Dasht-i-Kavir, or Desert of the Kavir, is also known in old maps as the Great Salt Desert, but the former is the name by which it is best known amongst the Persians. It extends approximately from 51° to 57° east longitude, and from 33° 30′ to 35° 30′ north latitude. Its greatest length from west to east is about 360 miles, and its greatest breadth from north to south about 150 miles.

It is partially divided into two portions by a chain of hills connected to each other by elevated and firm soil, about longitude 52° 30′ east. This chain comprises the Siah-Kuh, Kuh-Tulha, Kuh-Safeid-Ab, and a few lesser hills. The slopes connecting them consist of smooth, rounded, glacier-like slopes of gravel soil covered with small bushes, tufts of grass, and other vegetation. Fresh water is occasionally met with, but in small quantities only.

The desert itself is a depression into which all the waters from the surrounding country drain, and either lose themselves or form lakes or morasses. Its elevation, unless in the centre, is probably nowhere less than 2000 feet above sea-level. A reference to the map, however, shows that for Persia this is a considerable depression. Take, for instance, the towns on its borders, and their heights above sea-level : Teheran is

5800, Samnan 4000,* Kashan 3200,† Anarak 4675, Jandak 3390, and Dasgirdun 2850 feet, which latter even is several hundred feet higher than any portion of the salt desert.

The greater portion of this tract consists of *kavir*, or sandy soil strongly impregnated with salt. I have no doubt in my own mind that it has been formed by the evaporation of water which once covered it, and that at first it is a smooth sheet of mud, which as it dries swells and puffs up, being pitted with holes as large as a man's head. When in this latter condition, and after heavy rain, it becomes a regular swamp, and most dangerous, for at one moment a horse will be simply covering his hoofs with it, and in the next he will sink up to his girths. When damp, it has the colour of a freshly ploughed field of earth; but as it dries, its saline nature becomes apparent, and it glistens all over with salt. When quite dry it usually has a glazed crust on the surface, through which a horse's feet break with a crackling sound into the soft, powdery soil beneath. In many places it is covered with sheets of salt of varying thickness; this, as the *kavir* dries, splits up into blocks, sometimes standing on end in sharp ridges 1 to 2 feet in height, or else into lines of blocks leaning against each other in the shape of a V reversed, thus Λ. In other places immense deposits of salt rock exist, of such extent and thickness that nothing can break or dissolve them; they therefore remain smooth and firm, and as hard as a thick sheet of ice, in all seasons. Of such a nature is the immense deposit of salt known as the Dariya-I-Nimak, which lies at the south foot of the Siah-Kuh, and extends for about 440 square miles. Such is its hardness, that even when submerged for 2 feet or more during the rainy season, it is said to still afford a firm foothold to the passing traveller.

As to the origin of the salt desert, many geologists believe that most of the deserts now existing were once the beds of seas, and science and tradition both assert that where the barren desert of Persia now stands, exposed in all its dreariness of sandy wastes and salt plains, a sea once rolled its limpid waves. I made a collection of various marine shells, including oyster-shells, between Chashma-Gauhir and Baba-Khalet at an elevation of 100 or 200 feet above, and within 2 or 3 miles of the *kavir* bed. I showed these to Mr. Staal, a German-Russian geologist, who said that they were of an extinct species, and that for a period of from eight to ten thousand years at least there had been no sea there. None of the old historians, either, mention any sea, a thing that could not possibly have escaped their notice. It is also stated in Sir Frederic Goldsmid's book that the volume of water from the Persian rivers is probably much less than it was formerly. Also the evaporation which goes on in the desert during the summer months is

* Usually accepted height. I made it 3595 feet.

† 2730 by my observations.

so great that it is impossible for the rivers fed by the slight rainfall which Persia now possesses to refill its bed.

After heavy rain vast sheets of water cover the *kavir* in places for several miles; but these, with few exceptions, disappear as the hot weather progresses. The vast salt deposits existing would appear to indicate a steady evaporation for ages.

Tradition asserts that the *kavir* was once covered by a sea called the Daria-i-Saveh; that ships sailed upon it; and that Husen-Nun, Kashan, Pir-Hajat, and other places, were harbours. It is also believed by them that the sea dried up, or disappeared, on the same day that Mohammed was born, and that all the fish were turned into stone; and they also point out occasional mounds on the *kavir* far larger than the biggest vessel ever yet built, and say they are the remains of old vessels that were stranded on the disappearance of the waters. There is possibly a substratum of truth in these legends, which, I suspect, the mullahs have added, ascribing a far more recent date to the events than was formerly given. The stories current about ports, piers, light-houses, etc., whose remains are said still to exist, may be dismissed as idle tales.

The sandhills, of which there are a great number, are described elsewhere. I do not think that the *kavir* contains one great central basin into which all its waters drain, but is divided up by intervening ground, which is slightly higher. One of these basins is the swamp into which the Kal-Mura river flows. The direction of the river until it joins the *kavir* is south; after entering it flows nearly west, and, after running 30 or 40 miles, terminates in a salt swamp surrounded by tamarisk bushes, a dense growth of which mark the river's course towards it. On my visit in the winter of 1890, I could trace its course easily, as it was in flood, and the bushes were a vivid green; whereas in 1888 it was nearly dry, and all the bushes had lost their colour.

The Kal-Dasgun, Kal-Lada, and Pir-Hajat rivers also probably form sheets of water.

Another swamp, fed by the drainage from the hills above Samnan, Aradan, Siah-Kuh, Kuh-Tulha, and the Gugird ranges, lies to the south of the latter range, and possibly joins the one that lies in the middle of the Rig-i-Jin. This is probably the largest of all, but in May, 1888, the south-west portion of it consisted of a vast sheet of salt, with a few pools of water here and there, while in September, 1890, there was a far larger quantity of water on it.

The lowest altitudes I found upon the desert were near Chah-Mehji, 2130, and Kal-Mura river, 2280 feet above the sea-level. There is also a large swamp below Kishlak, which extends eastward beyond the Kuh-i-Gitcha.

The climate of the desert is not subject to those great variations of temperature that might be expected. My observations in summer and

winter prove that they are no more than might be expected in these latitudes. The highest I ever recorded was 104° at noon on the *kavir* of Bajistan, and the coldest was about 39°, though it is possible that it goes as low as 31° or 32°.

The mildness of its winter may be accounted for by its low elevation, its shelter by high mountain ranges, and the ground being either so warm or impregnated with salt that snow dissolves as soon as it touches the ground. Also the water absorbed by the desert keeps it so moist that as soon as the sun rises clouds and mists are formed, which prevent any frost.

It is worthy of note that the date palm, which extends northwards from the shores of the Persian Gulf as far as a line drawn through Kamarij, Darab, and Forg, does not occur again until Zarin, Pusht-i-Badam, and Tabbas are reached, the intermediate country being so elevated and exposed that it is impossible for trees of this nature to live. They are also found in most of the villages and towns on the borders of the desert and at a similar elevation. The furthest north that I can remember meeting them was at Turut and Husen-Nun.

One of the most remarkable features of this desert are the Gugird or Sulphur range of hills, which, commencing near the Siah-Kuh, extend eastwards to near Husen-Nun; they have been described in my former paper. In some parts a bed of blue rock is to be found beneath the *kavir* at a depth of 15 feet.

There is some discrepancy between my maps made in 1888 and 1890–91, especially between the Kal-Mura river and Chashma-Dubor. The later map is probably the more correct, as it was made with a plane-table, and I was going over the ground for the second time, while on the first journey I lost my way after crossing the Kal-Mura, and did not get into camp till near midnight; the ground adjoining the *kavir*, too, blends so gradually into it in many places that it is difficult to lay down any hard and fast boundary, especially where rivers flow into it, whose mud has fertilized the surrounding soil to such an extent as often to cover it with a rich growth of grass and bushes.

On the 7th of May, 1891, I left Isfahan alone after a stay of a few days, and started with mules to trace the course of Zenda-Rud river from there to its termination, and then to make my way across country to Yezd. Isfahan is at a height of 5300 feet. Our route lay along the left bank of the river, which consists of fresh water, is deep in places, and flows very swiftly. It contains lots of fish, but they refused both fly and spoon-bait.

For five days we passed through numerous villages and considerable towns, which were dotted over cultivated land intersected by irrigation streams. Most of the villages had large pigeon-towers close by. These are similar in shape to the Martello towers along our coast, but with this difference—that the entrance is walled up, and the roof has on

it several smaller towers like pepper-pots, and perforated with holes. The pigeons fly in and out of these holes, and one tower will contain several hundreds. The dung they drop accumulates within the tower, which is opened once a year for the contractor to go in and collect all he can; it is used for manure, and is highly esteemed. I used to stand outside them, and, with the permission of the inhabitants, often make a good bag of blue pigeons with my gun; but as a rule, after half a dozen birds had been shot, the people became alarmed lest they should go away altogether, and I had to go to another tower elsewhere.

On the fifth day we arrived at Varzunna, an old town containing about 400 houses and an old mosque whose dome was covered with beautiful antique-patterned tiles. The elevation was about 5000 feet. In the afternoon I bathed in the river and swam under the bridge. On going down to the water and undressing, a crowd of about a hundred people gathered round me, and an old man, their spokesman, said, "What are you going to do?" "Why, bathe, of course," I replied. "But we can't allow that," he said. "You will be drowned, and then we shall all get into serious trouble. The Zil-e-Sultan will say it was our fault, and we shall catch it." But I told them I could swim, and after a lot of remonstrance, two men got ready to follow me to render assistance, and I plunged in. "Can he swim?" they asked my servants, who replied in the affirmative. This extreme anxiety on my behalf was rather amusing. After a good bath, in which many of the people accompanied me, I came out.

Next morning we recrossed the bridge and resumed the march along the river's bank. After following its course for about 10 miles, over a desolate plain, we entered a thicket consisting of tamarisk and numerous other bushes and trees, which were in blossom, while the ground was covered with green grass. At noon we reached the bank of the river, which had curved off to the south slightly.

This tract of jungle is known as the Gau-Khane (abode of cows), owing to the excellent grazing obtainable. The temperature at noon was 71°, and the elevation slightly less than that of Varzunna. The river at this point is very deep, broad, and swift. Just beyond us it divided into a number of channels, forming a sort of delta, through which it flows for three or four miles before arriving at the lake. The place is said to be full of wild pig, and I saw lots of wild duck, which evidently stay here to breed and rear their young in the impenetrable thickets. There are numbers of sea-gulls and other water-birds about.

Next day we made a *détour* to avoid the swampy ground, and after going 8 miles reached the shores of the lake. From this point the water rolls its waves over a vast area, and appears to stretch away beyond the horizon; a delightfully cool breeze was playing over its surface. The temperature at noon was 79°, and the elevation by boiling water was 5215 feet; it is probably about 4950. The lake is about 25

miles in breadth from east to west, and perhaps 20 to 30 miles from north to south. In December, 1890, I viewed the lake from the Lagharek pass on the high-road between Isfahan and Nain, when its further southern shore was distinctly visible, appearing as a high and yellow bank, probably of sand, and I got bearings on a low red hill called the Takht-i-Sorokh, which is said to be just beyond its southern margin. Where I now stood we were within 200 yards of the water's edge, whose colour was a brilliant green except close inshore, where it was of a yellowish colour. Arriving within 30 yards of the water, a long bank of fine grey gravel about 12 feet high and 30 yards thick was reached. It had three successive water-marks on it, one at 8, another at 6, and the last at 1 foot. This latter, the most recent, consisted like the others of small driftwood, but contained in addition feathers and wings of sea-birds, and myriads of the bleached bodies of locusts. Beyond this beach lay a level expanse of soft clay, into which one's feet sank deeply. Passing over about 30 feet of this mud, the water's edge was reached, but it was so shallow that after going 30 yards into it there was only a depth of 18 inches. It was excessively salt. Flocks of white birds were resting on the water further out, and the scenery, though wild, was very picturesque. It is said that towards summer the southern end of the lake dries up and exposes a great sheet of rock salt, similar to that on the Daria-i-Nimak.

Kavir is here witnessed in what I suppose is the process of formation: first smooth mud near the water's edge, and then every stage, up to the dry brown plain, pitted with holes and studded with dry saline excrescences. The thicket previously mentioned stretched for 7 or 8 miles along the western shore of the lake, behind which was a high chain of sandhills. The desert between Abarguh and Chah-Beg, where there is *kavir*, drains northwards into the lake, but stretches south for many miles past Abarguh, Hashimabad, and Robat. The Zenda-Rud pours down a great volume of muddy water during the winter months, which is gradually filling up the northern portion of the lake. There are said to be no fish or shellfish, the water being far salter than the sea; the northern portion of the lake is said always to contain water, though in summer the river dwindles away to a small stream.

Leaving the lake, we ascended the hills to the east to Khargoshi, where there was a fine caravanserai built by Shah Abbas. The elevation was 6340 feet. Two more marches brought us within the Yezd district to Nodushan. This is a town of about 300 houses situated on both sides of a broad and dry gravelly watercourse, which flows through a broad pass in the hills to its north-east and drains on to the Yezd plain. It is down this pass that the best and shortest route to Yezd runs. There are low hills on either side of the town, which contains gardens, trees, and cultivation. The climate here was

delightfully cool and bracing, and the inhabitants were very civil and obliging. Its elevation is 6670 feet, and it is in the Pusht-Kuh region of the Kohistan. It is on the west border of the Yezd hills, whose base we skirted for the next two marches.

As I was riding along in rear of the caravan the following morning, I saw my groom stop suddenly and dismount, and, taking his gun, run towards a hill on the right, so I turned off and rode round the back of the hill, where I saw a very large and fat wolf, which made off into the hills. The groom said as he was riding along he heard the grey-hound that was following him cry, and, looking round, saw a large wolf crawling up to him. A little further on we met a shepherd, who said he had lost no less than fourteen sheep during that spring, which were carried off by the animal in question, which had been following and watching his flock for weeks.

Next day we crossed a pass 8400 feet above the sea, and reached a valley covered with villages in the Pusht-Kuh district, and two days more brought me to Yezd, where I heard that there was a movement against the Babis, three of whom were executed by having their throats cut by the public executioner, and were then stoned to death by the populace, after which their mangled remains were cut in pieces and exhibited to the victims' wives and children. I heard that the men who suffered showed great fortitude, and, though told that they had only to say that they believed in the true Mohammedan religion, that their prophet was false, and their lives would be spared, scorned to do so. I was also told that these persecutions would give a great impetus to the movement, and that each death caused numerous converts. This was my third stay at Yezd, during which I had been the guest of the Ardeshires, Parsi merchants, three brothers, who divided their time between this place and Bombay. I also visited the Parsi school built by one of them, where there were 150 boys, out of which 20 had learned to read English. The Parsis of Yezd—that is, those who live in the neighbouring villages—are of fine physique, and are noted for being good gardeners and cultivators.

My next journey was from Yezd to Abarguh, and thence on to Abadeh. The first part of my route lay through Taft, and then on to Sanijh, up in the hills at an elevation of 7700 feet, a beautiful and fertile spot. The houses were all mud and stone; but the curious feature of the place was the number of beehives, consisting of long coffin-like boxes, which encumbered the ground in every direction, so that one had to be careful. Crossing a pass 8400 feet in height, and descending, we arrived at Turum-Pusht, where there is a celebrated marble quarry. The prevailing colour of the marble, which exists in great quantities, is a pale transparent lemon hue, but there are red and white variations; the deeper they go the finer the colour. The quarry is free to anybody who likes to go and work it. The inhabitants work

as orders arrive, and can carve fairly well. The marble is in great request for tombstones, and large numbers formed of this marble are to be seen in Yezd and other towns. There are some old towers in the place, with inscriptions said to date from A.D. 1290.

The next place passed was Chah-Beg on the *kavir*, a mud fort about 5150 feet in elevation. The inhabitants were all suffering from skin-disease; the hair of many was falling off in patches, and they were clamorous for medicine, so I dispensed a carbolic lotion in large quantities to them. In fact, at nearly every village I went to the people wanted medicines, and got quite angry unless they had them. Having had some experience of their expectations in this direction on a previous journey, I had provided myself with twelve gross of antibilious pills and lots of quinine, which went a long way. Bad eyes are what they appear to suffer from chiefly.

Next day we reached Abarguh, with five or six thousand inhabitants, on a fertile plain on the west of the desert we had just crossed. Its height was about 5300 feet.

Two more marches brought us to Abadeh, a well-known town on the high-road between Isfahan and Shiraz, where I stayed in the telegraph-office with Mr. Glover. There were two tame panthers in the house, which he had procured from the neighbouring hills.

I left Abadeh on the 9th of June, taking with me two mounted attendants of the Governor of Shiraz, without whose assistance I might have had trouble with the nomad tribes, who wander about the mountainous country west of the high-road between Abadeh and Shiraz, which I was now entering.

On the first day we travelled within sight of the high-road and reached Eklid, a large town up in the hills, at an elevation of 7700 feet, a picturesque spot and very fertile. The governor, Agha-Khan, was very civil. After halting one day, we left the place and crossed a pass of about 8300 feet, and descended on to a plain where there were several thousand black tents of the Kashghai Arabs, whose flocks wandered in thousands over an immense grassy and well-watered plain. We halted at a small mud fort on its borders belonging to the Bakhtiaris, who had a row with my servants, and came rushing out of the fort with guns, the women carrying sticks and stones. However, they finally retired to the fort, shut the gate, and said they would shoot anybody who came near. We sent off to the Kashghais for assistance to procure us food and supplies, which they gave us, and all ended peaceably, the headman of the village being taken into Abadeh and bastinadoed before Mr. Glover a few days later for his incivility.

Next morning we halted at the camp of Isau-Beg, a Banseri, and later continued our march. As a rule, a khan's tent could be distinguished by its being of a white or coloured texture. I was told that most of the khans of the tribes have some of their sons or near relations staying at

Shiraz, where they become hostages for the good behaviour of their tribes.

A day or so further on brought us to Asupas, a small fortified place perched on a rock on a plain. A fine stream rises from a pool at its foot of very clear water, out of which, during a day's halt, I obtained some of the best fishing I have had anywhere, with a cast of three trout-flies; the fish ran to 1 lb., and rose readily. I got about twenty-five in the first hour. Lots of the inhabitants, and a regiment of Persian infantry halted there, came down to see the, to them, astonishing method of catching fish by their rising to an artificial bait thrown on the water. The regiment, which was the Sarawand infantry, were very orderly and well behaved, and did not appear to annoy the inhabitants in any way—a pleasing contrast to stories I have read, which described their march as dreaded by the villagers only in a slightly less degree than that of an invading army.

Near the town is the historic Gur-i-Bahram, a swamp in which King Bahram, while hunting the wild ass, got engulfed; his body was never recovered. It is also said that a gunner attached to the embassy of Sir R. Morier was drowned in the same place some sixty or seventy years ago. There are pools on it, out of which I got some 2-lb. fish with a fly; dry fishing. Large swamps covered with rushes abound in the neighbourhood, and are full of wild pig. The colonel of the regiment kindly put a guard over my tent to prevent any annoyance from the men.

Next morning we passed a grassy plain called Shah-Nishin, a favourite resort of the Persian kings. More passes and more plains and villages of similar nature brought us to a pass called by the cheerful name of Durrah-i-Duzdan, which means either the road or gate of thieves, a former haunt of those gentry. Over the pass, 8000 feet in height, and down into a picturesque valley through which the Kur river flowed, and on to Khan-i-Mun town. Above us to the south-west on the opposite side towered the Kuh range, about 14,000 feet in height, and covered with snow; and away to the west the distant summit of Kuh-Dinar was just visible. The town stood on the river-banks at 6000 feet. The khan was very friendly, and we stopped for one day. There were a lot of greyhounds in the village, and I bought two for half a crown, both of which were fine animals.

On leaving the town we forded the river, a fine clear stream about 40 yards broad, and ascended the mountains, passing through a forest of dwarf oak. In the evening, having reached 7300 feet, we halted at the Lur village of Talkun. Next day we ascended over a pass 8200 feet, and, descending into a valley, reached the Shaspi river, where the water rushes out from under a rock in a large clear torrent. Here we breakfasted.

One of my gun-barrels had got seriously dented by a fall. So I

heated the dented part in the fire, put in a ball-cartridge, and placed the gun behind a rock and fired it with a string to the trigger. The experiment proved successful; the dent was removed, and the gun became serviceable again. A Persian khan told me this was the way he always put his guns right.

We then climbed over the Kuh-i-Guer by a pass 9000 feet in height, where large patches of snow were lying about, and descended to Ardakan, a town of about 2000 inhabitants. The houses were nearly all built of wood, with large projecting eaves, and there were plenty of oak, walnut, and willow trees about. Height, 7700 feet.

The next march lay over a fertile plain, where we met the Shaspi river once more, and crossed it by a bridge near its junction with a stream from Ardakan. Then, descending down a very steep hill, we arrived at a village called Rudyan, at the bottom of a gorge between precipitous cliffs several hundred feet in height, which the river reached from the plain above in a succession of leaps. It was a very picturesque spot, shaded by fine walnut trees. There were three khans staying in the place belonging to different divisions of the Maimusenni Lurs, with whom I interchanged visits. Firearms were the chief topic of conversation, and they were much interested in my description of the new magazine rifle and of machine guns. They had some Winchester rifles amongst them, and shot very well. Elevation, 5900 feet. I caught some 4-lb. fish here with a live grasshopper.

On the second day one of the khan's sons took me to the top of a cliff about 3 miles off, where a stream fell down into the ravine below, a sheer drop of nearly 300 feet. There were lots of wild pigeons about. After going 6½ miles we struck the river again, and left it flowing away towards Kaleh-Safeid, a hill off to the west. We halted at Deh-Bawa, a Lur village on the borders of a forest, which we entered the next morning, and climbed over a pass on the Kuh-Nar 8500 feet in height, and descended into the valley of Bonru-Maidan, where the Kasghai Arabs were encamped of the *taifa* (division) *Ardeshiri*, which is, I believe, the Persian name for Artaxerxes. Elevation, 7500 feet. A horse here broke loose, and in trying to stop him a Kashghai was knocked down senseless, at which the tribe were very angry, and said it was my muleteer's, his owner's, fault. However, a little brandy soon revived him, and calmed his wife, who made a great row.

The next march over a pass brought us to another camp of nomads, and the day after we left the forest and arrived at Nudan, the first Persian village built of stone and mortar I had seen. The people were Lurs. The headman visited, and I noticed he sat down without removing his shoes. I asked the prince's servant the reason, and he said, "Oh, he's only a Lur; what can you expect? Besides, he has so many enemies about that he daren't even take his shoes off, for fear of being caught unprepared."

Leaving the village, we crossed the Shahpur river many times, and passed through a gorge amongst ruins and reached Shahpur. There were numerous ruins about of fine large blocks of stone, well squared and adjusted, and a fort on a hill, said to be the remains of the ancient city of Shahpur; there were also some fine sculptures on the adjacent rocks, in which the proportions of the figures and the graceful draperies reminded me of ancient Grecian work. They were in high relief, and, although much disfigured as regards the faces, the limbs of horses and men were sculptured with great regard for the correctness of the anatomical details.

It was now June 22, and the elevation only 2700 feet; the heat was consequently very great. A further march of 6 miles brought us on to the high-road between Shiraz and Bushir, about 11 miles west of Kazerun, so that we were now under the telegraph wires and on well-known ground. A few more marches by night brought us to the Persian Gulf, and as we neared it the thermometer stood at 105° in the shade at noon.

The march from Abadeh had been a most interesting one, on account of the beauty of the scenery and the numerous nomad tribes then inhabiting it. In winter the country is completely covered with snow, and the tribes move down to lower ground in the south, where they can continue to feed their flocks. I met one of these tribes on the march; they were a curious sight—herds of cows and immense flocks of sheep and goats grazed on what they could pick up as they passed along, while the women and children of the tribe were riding on donkeys, mules, and horses. There were numbers of pack-animals, heaps of large sheep-dogs, and mounted men armed. They made a great noise, and raised clouds of dust. The country between Abadeh and Kazerun has frequently been traversed by Europeans before, but all by routes from north-west to south-east, and I must have crossed half a dozen of their routes at least during my trip across this latter portion of country.

THE LAND OF THE BATAKS.*

By Baron ANATOLE VON HÜGEL.

As with other Malay races, Batak fashion prescribes certain mutilations of the body. In boys, at the age of puberty, the teeth are reduced in length by means of the chisel, mallet, and file, and are given a concave surface. When thus shaped they are tinted black, and in the rich these blackened teeth are embellished by being inlaid with gold or mother-of-pearl; or they are even quite hidden under a thin plate of

* 'Besuch bei den Kannibalen Sumatras. Erste Durchquerung der unabhängigen Batak-Lande.' By Joachim Freiherr von Brenner. Würzburg: Leo Woerl. 1894. Large 8vo. pp. 388. *With* 2 *maps*, 7 *plates* (6 *coloured*), *and over* 100 *engravings*. Continued from the January number

gold. In girls, the incisors are cut off level with the gums. Large perforations in the ears are considered beautiful, and both the upper rim (helix) and the lobe are pierced, the holes being gradually enlarged through youth.* Von Brenner does not speak of tattooing, nor of the scarifying of the body.

In dress these people conform largely to the ordinary Malay ideas. They weave in their hand-looms cotton fabrics of good design and colour for their sarongs, head-cloths, scarves, etc. Children go naked to their seventh year, but wear many metal ornaments.

Bataks are skilled gold and silver smiths: their ornaments are remarkable both for beauty of design and extreme delicacy of workmanship. They include bangles, belts, necklaces, and ear-ornaments. One form of the latter called *padung padung*, worn by Karo women, is very peculiar, resembling a double fish-hook the barbs of which have been replaced by flat spirals, and is curiously like a favourite design of the bronze period. Sometimes this ornament is of unwieldy dimensions, the silver of as many as sixty-two dollar-pieces going to the making of a single pair, and it is consequently so heavy that the upper end of the spiral must be fastened to the hair or the head-cloth. It is the silversmith's work to attach the *padung padung* to the ear. When half finished, he thrusts it through the hole in the helix, and turns one of the spirals when the ornament is *in situ*. Only for the very wealthy is the *padung padung* so fashioned as to allow of its removal from the ear. A golden star is sometimes set in the centre of each spiral. Of the less abnormal and more delicately worked ornaments, some varieties are only worn by men.

The artistic sense of the Bataks finds further expression in wood-carving and in decorative painting. Beautiful and elaborate designs, made up of geometrical figures, or conventionalized flowers, leaves, animals, etc., often very tastefully picked out in colour, adorn many portions of the interior and exterior of their houses. Rough, plain earthenware vessels, hand-made, *i.e.* without the aid of a wheel, are made by the women. Household utensils, water-vessels, boxes, troughs, hen-coops, etc., are made, almost without exception, of bamboo. No special head-rest is used. The Bataks fabricate their dagger and knife-blades from imported iron, and also prepare gunpowder and bullets for themselves. They are fond of music and dancing; their musical instruments do not seem remarkable.

Unlike their lowland neighbours, these people choose elevated sites for their dwellings. Their villages, which may be composed of from half a dozen to over two hundred houses, have a quaint charm of

* Dr. Hagen's paper, "Die Künstlichen Verunstaltungen des Körpers bei den Batta," gives a detailed account of these and other processes. Drawings of the instruments used, and of the mutilated teeth, as also of the ears bearing the huge Karo ornaments, are given. *Zeitsch. f. Ethnologie*, 1884, p. 217.

appearance quite peculiar to themselves. The houses, including the public buildings, are irregularly placed, but for each class a distinct orientation is always observed; thus, should the dwelling-houses face east and west, the other buildings will face north and south, and *vice versâ*, the two classes of buildings in one village never coinciding in this respect.

A strong palisade of bamboo immediately surrounds and guards the village, to which access is given only by one or two very small openings: but in some districts a stone-covered bank, strengthened occasionally by a fosse, takes the place of this fence. Beyond lie gardens and small fields, in their turn protected by a thicket of thorny bamboos, bushes, and large sting-nettles; while, in Karo-land, a copse, or even a fair-sized wood, must still be traversed before the village confines are finally left behind and the treeless plain re-entered.

A Batak house, like those of the Dyaks and of other related tribes, is a pile-dwelling, though not built over water. Its stout wooden floor is raised on wooden columns 10 to 15 feet in height, and projects as a wide platform in front of the doorway, which, barring an occasional very small window, is the only opening into the house. This platform is reached from the ground by a rough ladder or notched bamboo. The plank walls are barely 4 feet in height; they slope outwards, and bear an enormous, high-pitched, saddle-shaped roof, thickly thatched, and with deep overhanging eaves. Most often each end of the bent ridge-pole bears a great buffalo-head, with ears and spreading horns, cleverly fashioned of *hidjuk*, the durable net-like fibre produced by the sugar-palm, which is also largely used as a protection to the thatching.

Of these dwelling-houses (*rumah*) there are three recognized varieties, viz. "the chief's," "the rich man's," and "the poor man's house." The first is more elaborately decorated than the second; the third is quite plain, and varies slightly from the other two in constructional details. From ground to ridge the height of a *rumah* may vary from 30 to over 50 feet. There is also in each village a *bale* or *sopo*—the men's house—a *lotsung*, the *inggot báye*, and the *griting*. The *bale* is the most beautiful building in the village, and differs slightly in design and ornamentation from any of the three varieties of *rumah*; in the *lotsung* the women husk the rice, and it is their meeting-place, as the *bale* is that of the men. The *inggot bage*, the rice stores, which, like the houses, are supported on posts, vary in number in different villages. Lastly, the *griting*, the houses of the dead, which in shape somewhat resemble those of the Dyaks of Borneo, of which Bock, in his 'Head Hunters,' gives illustrations. In Karo-land these tombs are diminutive models of the dwelling-houses, about 4 feet in length. Within is a wooden coffin, mostly boat-shaped, and beautifully carved and painted, and in it the exhumed skull and larger bones of the dead man repose. In some districts the *griting* are much larger, and differ somewhat in design:

sometimes they are dispensed with altogether, and then the corpse, enveloped in mats, is suspended in the open from a horizontal bamboo, which is lashed to two uprights. No ground is set apart for the dead, and the *gritings* may be found singly or in groups in any part of a village; but, as cremation is also practised, they are not very numerous. Children who die before cutting their milk-teeth are buried under the floor of the houses, to secure their bodies from being used for medicinal purposes. Stables for horses, enclosures for buffaloes—these latter always built outside the village palisade—and a smithy, with various sheds and out-houses, are among the additional buildings which are frequently to be found in a Batak village.

The domestic animals of the Bataks are numerous. Their small strong breed of horses (*kuta*, *huta* = Hindostanee *kuda*, horse) has so distinct a character of its own as bespeaks long existence in the country. Averaging 12 hands in height, well built, and remarkably sure-footed, the Batak pony is in considerable demand, not only in the Dutch colony, but in the adjacent British dependencies. Strange to say, these horses are only reared for export, as the Bataks are in nowise an equestrian people. The cattle are small, zebu-like animals with short horns, and mostly brown in colour. Milk is scarcely ever used as food. The buffalo of these highlands is of strong build, and distinct in breed, both from the Javanese and the Indian, is reared to be solemnly slaughtered and eaten on great festivities. Herds of semi-wild buffaloes infest certain districts. Goats are scarce and little thought of. Pigs are reared by all, and by their number the wealth of their owner is told. These lanky brutes, with stiff mane and long black bristles, have skulls which closely resemble those of the *Sus scrofa palustris* of the Swiss lake-dwellers.

In the dogs, which abound in every village, and which in appearance resemble the Indian *paria*, we find an interesting breed which, like the pigs, takes us back to prehistoric days, their skeletons closely resembling those found with the remains of the earlier European lake-dwellings. These animals are very gentle and timid in disposition, and no European has ever succeeded in making friends with them; but they live in the Batak houses, and have learnt to run with ease up the rickety ladders by which the door is reached. It is the fashion for a puppy to be brought up with each child, and it is the duty of the *cabau*, as this dog is called, to keep the baby clean. The *cabau* is well treated, but the other dogs have to look out for themselves. Some of the dogs are roughly trained to hunt the quail. Cats are scarce, and a tailless breed seems to be developing itself. Fowls of a degenerate breed are found everywhere; pigeons only here and there.

The fields and gardens are tilled with great care; it is the work of the women, the men helping them only occasionally. The Batak plough is very small and of primitive construction. It is drawn by a buffalo,

or, as often as not, by a woman. For digging a long spear-like stick is used. A number of women stand in a row, each holding one of these digging-sticks in her hands; these they thrust simultaneously into the ground, and, shaking them vigorously, quickly detach large sods of earth. Rice, of which there are many varieties, is by far the most important of the crops; but a good deal of maize (which grows low, but bears well) is grown, also sweet potatoes, a few species of beans and other vegetables, herbs, and spices. Coffee is often to be seen in their vegetable gardens, cultivated, not for its berries, but for its leaves, which are dried over the fire and used like tea. Tobacco does not flourish in the highlands as it does on the lower slopes of the coast land, but a good deal is planted; and recently the opium poppy has found its way up country.

The *slaun* or *sanam* (*Marsdenia tinctoria*), a low-growing, large-leaved creeper, discovered by Marsden in 1780, is preferred by the Bataks to the indigo-plant for the fine blue dye which it produces, and it is consequently much more grown than the latter. Tapioca, cotton, the papaya, and the *pisang* (banana), are only cultivated in the low-lying districts. Boiled rice is the diet of the people, though a certain amount of meat—both fresh and dried—fish, vegetables, fruit, and spices are also eaten. A palm-wine, *miyah* or *paulo*, is prepared and drunk when half fermented. It is slightly intoxicating, but drunkenness seems to be quite unknown. Men and women are inveterate betel-nut chewers.

Large game, which is confined to the wooded region, is killed with the blow-pipe and poisoned darts. Quails are found in the grass-land, and are hunted in a very peculiar manner. The hunter is armed with a *rewa*, i.e. a stiff 12-foot bamboo rod surmounted by a small kite-shaped frame on which a net is stretched. Trained dogs find the birds and put them up, and the hunter, with surprising agility, catches them in this singularly inefficient-looking contrivance. For monkeys they have a strange trap—a kind of guillotine, the wooden knife of which imprisons in its drop the hand or neck of the little beast, when stretched out to seize the fruit with which the trap is baited. Fish are caught with net and set lines; sometimes also with the *dusun*—an ingenious automatic rod and line. It is set by means of a string attached to the snood, which is so fastened underwater to the bank, that the wriggling of the hooked fish releases it, when the springy bamboo rod, stuck into the bank, flies up and lifts the fish out of the water.

The Bataks have two sorts of canoes—both "dugouts"—the *solu bolon*, used for war or commerce, from 30 to over 100 feet in length, carrying from 30 to 150 men; and the *solu ratsaran*, or fishing-canoe, which, as a rule, holds only one man. Some *solus* are provided with outriggers. The bows of the *solu bolon* are ornamented with a carved upright piece of wood, often representing a human mask.

The social life of the people has many characteristic points. Exogamy is the rule, and blood-relationships, even the most distant, are respected. Polygamy is rarely practised, though an acknowledged institution. There is no "chief wife," but all the women of one household have an equal standing. A bride is purchased from her parents, the marriage-money varying from 50 to 120 Spanish dollars. Few youths under seventeen are consequently married, as some time is required to save so large a sum. Clothes and ornaments are the wife's only dowry. She is well treated, though hard worked. A man is bound to take to wife his brother's widow. As soon as a child is born, the *guru*, or fetish-man, is asked for its horoscope. He has also to select a right name for it, which he finds in the following manner. "A name is mentioned; he thrusts his hand into a heap of rice, seizing what he can with three fingers, and then counts the grains, pushing them aside by fours. Should the total be divisible by four—*i.e.* no grain remain over—and should this occur thrice, then is the choice ratified; but should this not be the case, new names have to be sought for till the manipulation has succeeded three times." The *guru* finds the names by the aid of "luck-tablets"; but occasionally his services are altogether dispensed with, as the father, on account of some dream or inspiration, acts in his stead. It is the father, also, who performs the actual ceremony of naming—a ceremony strangely resembling Christian baptism. He takes the child to some running water, washes it, and pronounces over it the name, as well as a special formula. Circumcision is practised, but without attendant ceremonies.

The religious belief of the Bataks is peculiar and suggestive. It acknowledges one god (*Debata*), an almighty being creator of the world, and his three sons—the god of justice and teacher of men, the god of benevolence, and the god of evil, the tempter, to whom, of all three, the greatest influence is ascribed. To the sons the father gave the management of his creation, and they, in their turn, have as deputies many smaller deities or spirits (*begu*)—of the sky, the earth, and the lower world. Spirits are found everywhere and fill every place. The legend of the creation is very strange and weird. The only representative of a priesthood is the *guru*, sorcerer and prophet. Those of the *Pakpak* tribe are the most renowned. The *guru* knows the qualities of the *begus*, who cause all diseases, and he can influence them. The *si basso* is a person possessed by a *begu*, who acts the part of a medium; there are many of these, both male and female. The insignia of a *guru* is a small carved staff, hallowed by many strange and horrible rites, and deriving its special powers from the presence of a particle of the brain of a boy, cruelly tortured to death as part of the ceremony of its consecration. Fortunes are told by the aid of the *perhalaan*, or luck-tablet, a small quadrangular board divided into squares, which are inscribed with mystic signs and symbols. Auguries are read from the viscera of

animals, etc. Special qualities are assigned to each day of the month. Wooden fetishes, rudely carved to represent human figures—by Von Brenner erroneously called idols—are made by the Bataks. They are scarce, but a great variety of amulets are worn, the strangest of these being an armlet made of the lips of an eaten human being, which foretells danger to the wearer by becoming loose on his arm.

Of medicine the Bataks possess some knowledge. Their specifics are chiefly vegetable, but they have also many superstitious remedies, among which human flesh plays an important part. A form of massage is practised. The sick are well tended, but abandoned as soon as life is despaired of.

Cannibalism, and of a most barbarous kind, is practised by all the tribes but one; amongst some it is even a legal institution. At times the flesh is cut from the living victim, but it is usually provided by those slain in war. The Karo tribe alone appears to be entirely free of this practice. By some tribes the hands of those eaten are preserved by smoke, by others the lips are chosen. Skulls are greatly prized, and, in bunches, often adorn the *bale*. A human tooth is frequently let into the cover of a box, so that as often as the box is opened, the tooth may be struck and its former owner insulted.

A well-defined though unwritten code of laws exist. Offences are punished by money fines or by death, the latter sentence sometimes including the eating of the condemned person. Grave offences are adjudged by the chief and people; lesser ones by him alone. Oaths are taken, but by men only. They are sometimes sufficient to clear the accused. A prolonged drought is considered as a sign that a special crime against morality has been committed. Neighbouring villages then unite to discover the guilt or innocence of those on whom suspicion has fallen by the strange ceremonial test of the "rocking-baskets," which seems akin to the idea of table-turning.* But strangest of all is one of their acknowledged methods of obtaining redress for an injury, viz. the *musu berngin*, or "night enmity." Three letters, consisting each of a large inscribed bamboo-leaf, are attached, one after another, at regular intervals of time, against or near the offender's house. The first is a simple demand for inquiry into the grievance; the second an emphatic demand for redress; while the third, which may be decorated with miniature knives, spears, and torches, pronounces a threat of arson and murder against the offender. Of these threatening letters one which Von Brenner translates ends as follows: "My home is soaring in the mountains, my name is hawk, my father is the night ape in the mountain," and is signed, "The heart-sickened one."

The Bataks are constantly engaged in petty feuds, which consist largely, however, of threats, feints, and empty words. In serious war

* The author, p. 212.

they will sometimes fortify a position with entrenchments, though the palisades and ordinary defences of the villages are in most cases considered sufficient to keep off attack, the enemy's approach being also hampered by spiking the paths with concealed pieces of sharpened bamboo. They manufacture their own gunpowder, and, apparently with the idea of increasing the brilliancy of the flash and the noise of the explosion, particles of leaves, which have been plucked during a thunderstorm or an earthquake, are mixed with its ingredients. Guns and rifles, with home-made stocks, have replaced all native weapons but the knife and the dagger; and of these, though each tribe has its own variety, none are specially noteworthy. May not the form of these knives, etc., have been influenced by the weapons regularly imported by Dyak traders (see footnote, p. 5)? With the Bataks, as with the Coast Malays, a dagger is part of a man's full dress. Spears and the small quadrangular hide shields are now scarce ever seen.

The Bataks possess a literature of their own. Their *pustakas* (*pustaka*, a pure sanscrit word signifying "book") are made of a continuous strip of bark which, in Chinese fashion, is folded into book form, and is written on by means of a style. These books treat almost exclusively of matters connected with sorcery, medicine, religion, and the like, and are generally kept by the *guru*. The alphabet in use has been affirmed by some writers to be of their own invention; * but this is an error, for their characters have been traced back to the Indian mainland. As Keane observes, "The Batak is one of the eleven Malayan writing systems, which are ultimately based on the archaic Devanâgari of the Asoka inscriptions," out of which seven still current, four are found in Sumatra.† The Bataks have a tradition, which Von Brenner gives as follows: "that all learning and books have sprung from a great bamboo which one day shot up in Timor; as the leaves dropped from the shoots they proved to have been written on by *Debata*, and the *gurus* transferred these signs to books."

It remains to be said that the work is well illustrated, and this is all the more creditable to the author, considering that he lost a large number of his negatives and drawings. Two maps are given: (1) the independent Batak lands around the Toba lake; and (2) on a larger scale, the land of the Karo Bataks. An excellent idea of the mountain ranges may be gained from two plates of panoramic views drawn in outline. There are also five plates (four of which are coloured), representing native carvings and book-illustrations. But the general reader will be most interested in the many excellent engravings of the scenery, the people, their manufacturers, etc., which have mostly been reproduced from photographs taken by the author. We cannot, however, but regret

* Stanford's 'Australasia,' p. 340.
† *Ibid.*, Appendix, p. 624.

the space given in a book of serious travel to portraits of private friends, and to such meaningless embellishments as those which adorn the commencement of each section. The book would also have greatly gained in value if Baron von Brenner had marked more clearly which of the many interesting facts collected by him we owe to his own personal observation, and which to his careful study of the works of previous travellers. This is especially regrettable in the chapters which he devotes to the people. There is, it is true, at the end of the book, a list of authors, but this helps us little, as but few references to their works are given in the text. We farther are at issue with the title of the book, 'Visit to the Cannibals of Sumatra,' as being both sensational and misleading. The author spent some weeks with the gentle Karo Bataks, who are not cannibals, but he only made a rush through a portion of the cannibal districts, during a large part of which time (a week) he had no alternative but to remain afloat upon the Toba lake, and consequently saw but little of the inhabitants of its inhospitable shores.

These few criticisms would not suggest themselves if the book were not in itself so excellent, and one which we can cordially recommend to any who may wish to inform themselves fully about a most interesting and little-known region.

A VISIT TO LAKE CHIUTA, BRITISH CENTRAL AFRICA.

By ROBERT CODRINGTON.

[The following extract, from a report to Her Majesty's Commissioner and Consul-General for British Central Africa, by Mr. Robert Codrington, Assistant Collector in the Zomba district, has been kindly placed at the disposal of the Society by the Marquis of Salisbury.]

I left Chikala Fort on the morning of August 6, and proceeded down the north-east slope of the mountain to the Ngande river without incident. My party consisted of five Sikhs, eleven armed Atonga, and sixty-two porters from the chief Chechikweyo. After crossing the Ngande river I continued down the Mikoko river, my intention being to follow the path to Madziabango across the dry bed of Lake Chilwa. That night I camped at my old camp at Chenapini on the edge of the Ntoradenga swamp. On the morning of the next day, August 7, I marched on to Madziabango, where there is a plentiful supply of water in pits, which is, however, bad. As I approached the place, people were seen running away, fires were burning, and some grain was left behind which was in process of pounding. About 2 miles from Madziabango I turned to the north-east at a place where the path diverged to Zarafe's, Kawinga's, and the probable road to the coast. I camped that night at Panakatope swamp, the water of which was very bad.

The following morning, August 8, I proceeded to Nachimbwe's

village. The village appeared very large, and stretched for 4 or 5 miles along the edge of Chiuta, which here for the first time showed any appearance of open water.

The next day, August 9, I spent on the lake, visiting Chiuta island, from the highest point of which Chikala and Zomba mountains were distinctly visible. There are no people living on the island, on account of its being rocky and unfitted for cultivation, and only accessible at one or two places with great difficulty owing to the grass. On the west side of the island no open water was visible, but the swamp appeared to extend a considerable distance to the south-west. I noticed that the water was called "a river" ("lusulo") both here and elsewhere, and not "a lake," and that Chiuta referred to the island,* and in a general way to the whole district.

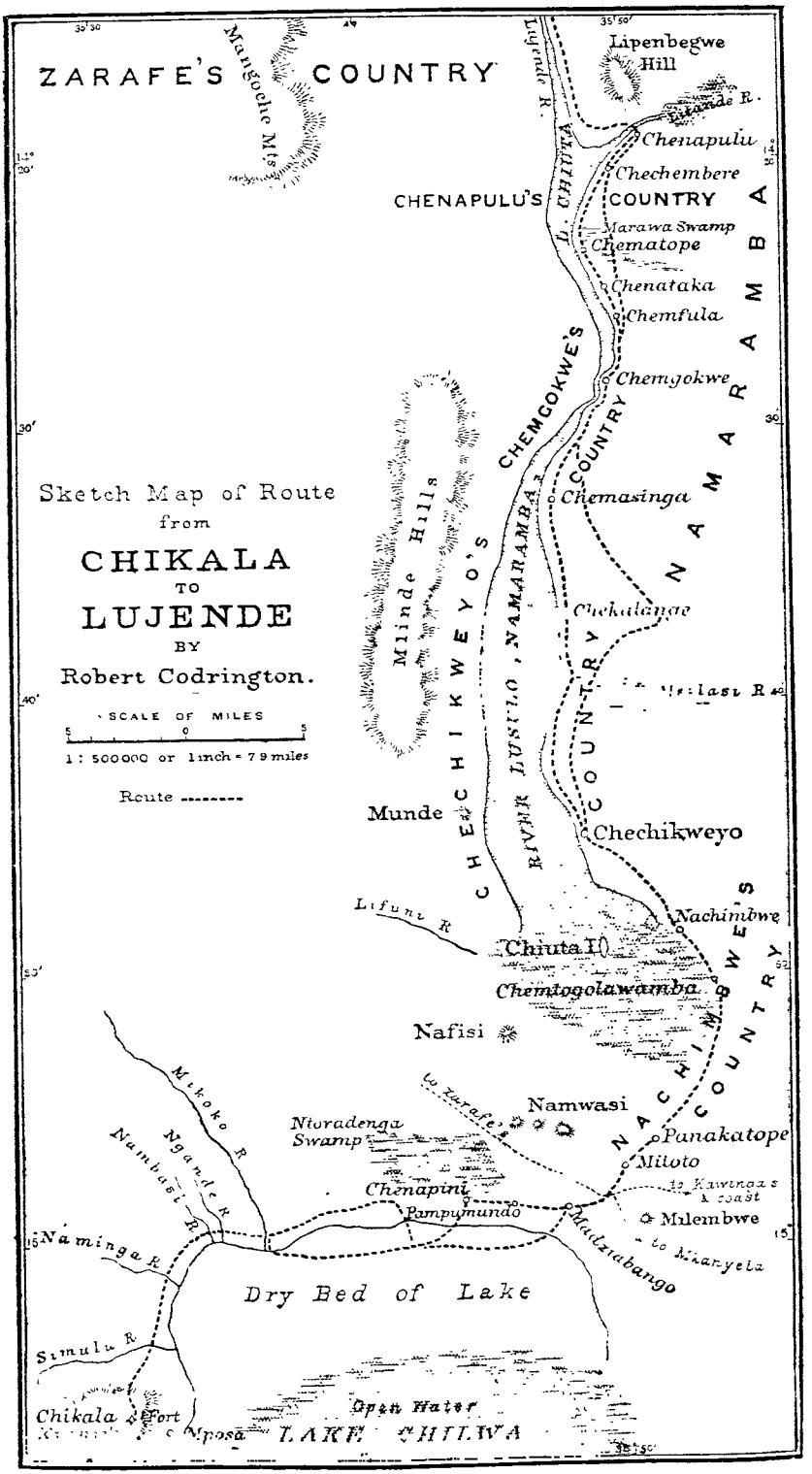
From Nachimbwe's I proceeded to Chechikweyo's town, which is 6 miles to the north, where the river was at its broadest and almost entirely free from grass. The depth of the water here and at the other places I visited varied from 3 to 12 feet, and was for the most part 5 or 6 feet. I then proceeded to Chemgokwe's village, 21 miles, there being a succession of villages all along the river. The river was much narrower here, 350 yards. All the houses were built on piles or on ant-heaps, of which there are many. On the following morning, August 12, I marched on to Chenapulu's, 12 miles, whose villages stretched along the river, which is here joined by the Litande and Lujende. The water is completely open and free from grass, and is about 700 yards across at its greatest breadth.

I then crossed the Litande, and marched up the Lujende river in search of a ford by which Zarafe's people are said to cross on occasions in going to and from the coast. I was shown a path leading south-east, and told that the ford was two days' journey up the Lujende river, and understood that the Madziabango path was the most likely route for Zarafe's people to go out by. I then returned to Chenapulu, and witnessed the arrival of a caravan from the coast (Kumbwane) which had been absent two months. The next day, August 13, I started back, taking a slightly different route entirely along the side of the river. I arrived at Chechikweyo's on August 15, and paid off my carriers according to agreement, relying upon Chechikweyo's promise to supply me with carriers back to Zomba.

I found, however, that, owing to rumours that Zarafe's people were waiting for me at the north of Lake Chilwa, it was impossible to get a single carrier. Chechikweyo did not assist me in the least, and I was obliged to destroy and leave behind six bags of "mapiri";† I then pushed on, my armed Atonga cheerfully carrying as much as they could

* Alternating with the word "Namaramba."

† Durrha corn.—H.H.J.


ZARAFE'S COUNTRY
Mangochi Mts
Lipenbegwe Hill
Lifunte R.
Lunde R.
Chenapulu
Chechembere
CHENAPULU'S COUNTRY
Marawa Swamp
Chematope
Chenataka
Chemfula
Chemgokwe
CHEMGOKWE'S COUNTRY
NAMARAMBA
Chemasinga
Mlinde Hills
CHECHIKWEYO'S COUNTRY
RIVER LUSITU, NAMARAMBA
Chekalanga
Munde
Chechikweyo
Lifuni R
Chiuta I.
Nachimbwe
Chemtogolawamba
NACHIMWEO'S COUNTRY
Nafisi
Mkoko R
Ngande R
Nambazi R
Ntoradenga Swamp
to Zarafe's
Namwasi
Panakatope
Miloto
Chenapini
Pampumundo
to Kawinga's coast
Mulembwe
Naminga R
to Mkanyela
Dry Bed of Lake
Simulu R
Chikala Fort
Mposa
Open Water
LAKE CHILWA
Sketch Map of Route from CHIKALA TO LUJENDE BY Robert Codrington.
SCALE OF MILES
1 : 500000 or 1 inch = 7.9 miles
Route

manage, having first of all had an angry interview with Chechikweyo, whom I found all along most unreasonable, and at times overbearing and insolent. After I had gone 5 miles, a messenger caught me up, saying that Chendali, the chief's heir, was coming to help me to Nachimbwe's, where I should be able to obtain men, and he soon afterwards arrived, bringing a great number of men, whom I refused to take. Whilst I was resting more men came up, bringing flour and goats from Chechikweyo. These I refused, and sent all the men back, but Chendali and some others followed me to Nachimbwe's. There was some further difficulty at Nachimbwe's about carriers, but the chief behaved very well and ordered his men out, although afterwards some threw down their loads and ran away.

I arrived at Panakatope on the 16th, and on the 17th marched to the Naminga river, 36 miles, and on the 18th to Chikala. Before reaching Madziabango, which is the south-east boundary of Zarafe's country, a fresh camp was seen of some forty men, and again at Pampumundo wells, which were visited for water. People ran away at our approach. As my carriers were unreliable, I kept my caravan as much as possible in the open plain, and reached Chikala without hindrance, although I am under the impression that my movements were watched. All the chiefs except Chechikweyo appeared pleased to have a powerful friend, and I was everywhere received with the greatest cordiality and overwhelmed with presents. Nachimbwe, who, although a vassal of Chechikweyo's, is a powerful chief of a most loyal character, was especially cordial, and on my return had a flotilla of canoes waiting to take me across the river to dodge Zarafe's people at Madziabango. These I declined to accept, as I was unwilling to get mixed up in the swamps, and was in a hurry to get back. The people appear very poor, have very few goats and no cattle. The chief crops appear to be casava and semsen (Yao, "mkwiwa"), which are unaffected by locusts, of which there were many about, and which are said to have caused much famine for many years. The houses were wretched, and my general impression of the people is that they are lazier even than other Yaos, and the reverse of warlike. They spoke of war brought to them some years ago by Angoni, when they took to their houses in the river, which they are preparing now for an emergency. No European appears to have gone beyond Chechikweyo's, and they knew very little or nothing of the Portuguese except as the white men at the coast.

RECENT DISCOVERIES IN THE BASIN OF THE RIVER MADRE DE DIOS (BOLIVIA AND PERU).

By CLEMENTS R. MARKHAM. C.B., F.R.S.

Two Bolivian expeditions and a Peruvian expedition have recently extended our knowledge of the navigable part of the great river Madre de Dios, a principal tribute of the Beni, draining the forests of Paucartambo, and the portion of the eastern cordillera of the Andes in the department of Cuzco, in Peru.

The previous history of the exploration of the river basins of the Beni and Madre de Dios (Amaru-mayu) was given in a paper read on April 9, 1883 (*Proceedings*, N.S., vol. v. p. 313), introductory to the narrative of the exploration of the Beni in 1880–81 by Dr. Edwin R. Heath. An account of the subsequent voyage of Fray Nicolas Armentia in 1884 down the Beni, and up the river Madre de Dios for about 200 miles, was communicated to the Society by our Honorary Corresponding Member, Don Manuel V. Ballivian of La Paz, and appeared in the number of our *Proceedings* for March, 1891 (vol. xiii. N.S. p. 185).

Dr. Edwin Heath and Señor Ballivian have now forwarded to us a letter from Colonel Pando to Father Nicolas Armentia, dated April 26, 1893, and an official pamphlet * containing the report of Dr. Ramon Paz, who led an expedition up the river Madre de Dios in 1894.

Colonel José Manuel Pando, with an engineer named Muller and several young Bolivian volunteers, set out to explore the river Madre de Dios in October, 1892. He was supplied with compass, sextant, and chronometer, and corrected his traverse-survey by daily observations of the sun. After some useful preliminary work on the Beni, Colonel Pando commenced the exploration of the Madre de Dios, in a steam-launch belonging to Messrs. Roca Brothers, on February 2, 1893. But the engine broke down, and they had to continue their course in three canoes. A large affluent on the right bank, in 12° 24′ S. and 73° 47′ W. (of Greenwich), was named after Dr. Edwin Heath. Here Colonel Pando formed a camp of seven men, under his assistant Ibarra. The engineer Muller proceeded to explore the river Heath in a canoe, and the colonel himself continued the discovery of the main stream of the Madre de Dios. He passed numerous picturesque islands rising high out of the water, and a large tributary on the left bank was named after Lieut. Gibbon, U.S.N. At length the mouth of the river Inambari was reached in 12° 42′ S. and 74° 23′ W. (of Greenwich). The width at the mouth was 325 yards, and the depth over 15 fathoms. The Madre de Dios continued in a north-west direction, flowing from the Andes, distant about a

* 'Ministerio de Gobierno y Colonizacion. De Riberalta al Inambari, Informe del Doctor Ramon Paz, Jefe de la Expedicion' (La Paz, 1895).

hundred miles, clear, majestic, and full of islands. The Inambari has a sinuous course, coming from the south-west, and receives many tributaries, among them a river named the D'Orbigny, the mouth of which is in 13° S. and 74° 34′ W. (Greenwich).

Colonel Pando returned to his camp at the mouth of the river Heath, and on March 26, 1893, he set out on a most adventurous journey overland, from the encampment at the confluence of the Heath and Madre de Dios to the Madidi. His way was through dense forest, and he relied solely on his gun for food. The party safely reached Ixiama, by descending the Madidi, on April 20, whence he addressed the letter to Father Armentia at La Paz, a copy of which we have now received through the kindness of our Honorary Corresponding Member, Dr. Edwin R. Heath, of Kansas City. Colonel Pando, who is a scientific surveyor, deserves high credit for the able and resolute way in which he achieved this very interesting and important piece of geographical discovery.

Dr. Ramon Paz was sent to take formal possession of the region newly discovered by Colonel Pando. He was accompanied by three officers of the Bolivian topographical department, a naturalist, and an escort of ten soldiers. The expedition embarked on board a steam-launch built by Messrs. Cochrane of Birkenhead, 58 feet long by 13, and 10 feet depth of hold, drawing 1 foot when unloaded, and 3 feet with cargo. She is propelled by a stern wheel, and fuel was obtained, when necessary, from the forest on the river-banks.

Carmen is a settlement on the Beni, above the confluence of the Madre de Dios, which may be considered as the port for the latter river basin. Its district contains a population of about a thousand souls, and has an annual yield of 225,000 lbs. of india-rubber. The expedition under Dr. Ramon Paz left Carmen on April 10, 1894, and entered the Madre de Dios. The ascent was successfully made beyond the furthest point previously reached by Armentia, and the explorers had the satisfaction of arriving at the confluence of the great river Inambari, which drains the Peruvian province of Caravaya. This confluence had been previously discovered by Colonel Pando. The headwaters of the Inambari are famous for their rich gold-washings, and their sources are in the forests yielding the most valuable kinds of quinine-yielding chinchona trees. The return down stream to Carmen was performed without difficulty in two days. The river Madre de Dios is broad and easily navigable, but full of islands. Commencing from the Beni, as many as sixty-three islands received the names of those who have been connected with the exploration of the basin of the Madre de Dios, such as Bovo de Revello, Maldonado, Terrazas, Cardenas, Markham, Church, Ballivian, Campero, Pando, etc. On the upper part of the river's course the shores are lined with cliffs of considerable height. There are numerous affluents, but only two of considerable size, the Heath and the Inambari. The main stream of the Madre de Dios

averages a width of from half a mile to a mile, its volume being nearly double that of the Beni at the junction. The current was found to be flowing at the rate of 3 miles an hour. The rate of the launch in descending was 7 knots, which, added to the 3 miles current, make 10 knots an hour during forty-four hours. Dr. Ramon Paz describes the flowers of the river-bank vegetation as beautiful beyond words, and supplies of game and fowl were abundant. Carmen is placed in 11° 57′ S. and 73° W.

The wild tribes met with on the Madre de Dios are the Araonas, Pacaguaras, Caripunas, Toromonas, and Guarayos, which are all described in the 'List of Tribes in the Valley of the Amazon,' published by the Anthropological Society in the present year. Dr. Ramon Paz supplies a short vocabulary of the Araona language.

A Peruvian expedition has also descended the Madre de Dios from its sources in the Andes, arriving at Carmen on the Beni in September, 1894. It was commanded by Don Carlos Fermin Fiscarrald, whose companions were two Peruvians named Zorrilla and Sarria; Mr. Charles Alfred Cockburn, an Englishman; and thirty men. They had ascended the Ucayali from the Amazon, and the Urubamba to the point where it receives the Camisea. Up to this point the whole river system is navigable by steamers. The Camisea is only suited for canoes. The explorers ascended it, crossed the ridge, and went down a stream called the Terjali, which conducted them to the river Manu. The passage of the ridge, dividing these streams, only occupied them fifty-five minutes. Here they constructed a large canoe 65 feet long and nearly 5 feet in width. While they were thus occupied, an advanced party of eight of their men was attacked by the Chunchos Indians of the Paucartambo forests, and one man was killed by their arrows.

As soon as the canoe was finished, they descended the Manu to its junction with the Piñi-piñi, where the combined streams take the name of Madre de Dios. From that point they reached the mouth of the Inambari in six days, and thence descended the river to Carmen on the Beni. Señor Fiscarrald is an enterprising merchant, who has established a station on the Ucayali, at the junction of the rivers Tambo and Urubamba, and employs twenty boats in collecting produce for export. His discovery of an easy and short route between the basins of the Ucayali and the Madeira is not only of geographical interest; it will lead to great commercial results. The Madre de Dios is found to be a magnificent river without obstructions, and the region it traverses is one of the richest in the world. The slopes of the Andes yield coffee and cacao of unequalled excellence; they are the home of the best species of quinine-yielding chinchona trees, and they abound in gold. In the lower forests there are inexhaustible supplies of india-rubber of the best quality, and many other valuable products.

Our Honorary Corresponding member, Señor Ballivian, has been most

diligent in furnishing us with geographical information of great value, and the Society has again to thank him for the present interesting communication. The Society is also indebted to our other Honorary Corresponding Member, Dr. Edwin R. Heath, for transmitting a copy of Colonel Pando's important letter.

PROFESSOR RAMSAY'S WORK ON PHRYGIA.—REVIEW.*

By Sir CHARLES W. WILSON, K.C.B., K.C.M.G., etc.

Prof. Ramsay's important work on Phrygia is dedicated to the supporters of the Asia Minor Exploration Fund, amongst whom the Royal Geographical Society has ever been prominent. The liberal contributions of the Society have been more than justified, for rarely in the history of exploration has so much been accomplished at such small cost. It is almost impossible to exaggerate the value, to students of historical geography, of the results obtained by Prof. Ramsay, Mr. Hogarth, and the gentlemen who have either accompanied them or followed in their footsteps. A flood of light has been thrown on the history and geography of Asia Minor; on the art, social life, commercial relations, and religious customs of the various races that have inhabited the country; on the status of Christians and the Church in the Provinces under the Roman emperors; and on the changing fortunes of the long struggle that ended in the triumph of the crescent and supremacy of the Turk.

Prof. Ramsay has published many of the results of his labours in his 'Historical Geography of Asia Minor'—a work issued by this Society as one of its Supplementary Papers, and in numerous communications to the Hellenic and other societies. But these must, in some sense, be regarded as introductory to the greater work which he has always had in view, and of which the present volume is a first instalment. His scheme has been to make an absolutely fresh work founded on the ancient authorities alone, in which the geographical situation, the natural surroundings, and the commercial advantages of each city should be set forth in an account of its history. As geographers, we may regret that he has adopted the plan of a 'local history.' We lose the broad generalization which is of such importance to geographical science, but we have in its place well-drawn pictures of local life and scenery, and we must allow that an historian of Phrygia would have found any other course beset with difficulties.

In accordance with his scheme, Prof. Ramsay has parcelled out Phrygia into districts, and his intimate knowledge of the country has enabled him to bring clearly before us the influence that geographical

* 'The Cities and Bishoprics of Phrygia.' By W. M. Ramsay, D.C.L., LL.D., etc. Vol. i. ("The Lycos Valley and South-Western Phrygia"). Clarendon Press. 1895.

position and topographical environment have had upon the social and political condition of the inhabitants of the various towns and localities which he describes.

The first volume opens with a general description of the Lycos valley, its scenery, its ethnology, and its history. Through the valley ran the "Eastern Highway," which, under Roman administration, was one of the most important thoroughfares in the empire; and in it were situated large towns, such as the Lydian Hierapolis, the Phrygian Colossai, the Carian Attouda, the Seleucid Laodiceia, and the Pergamenian Tripolis. In the diffusion of Christianity the valley played a prominent part, and in after-ages it was the scene of constant fighting between the Byzantines and the Seljûk Turks. As the nomads spread over the valley, the population decreased, and the land passed out of cultivation. Hierapolis was deserted, the Laodiceans moved to Denizli, the Colossians to Khonai, and the Trapezopolitans to Kadi Keui; and their descendants, partly Christian, partly Moslem, may still be found in those places. There has been little mixture of race; neighbouring villages remain distinct from each other in blood and in manners, and some of the customs have possibly been handed down from Phrygian, Seleucid, or Pergamenian ancestors. A pagan god or Christian saint appears as a Moslem *dede* or heroized ancestor; a Christian bishoprick succeeds to the priesthood of an old *hieron;* and a place of pilgrimage sometimes turns out to have been a noted shrine of Artemis or Sabazios.

A very full account is given of Laodiceia, a city founded by Antiochus II. to strengthen the hold of the Seleucid monarchy on the country, and partly peopled by Syrians. Under the Roman emperors it was one of the richest cities in Asia, a centre of banking and financial transactions, and a manufacturing town noted for its fine cloth, its carpets, and its various kinds of garments. These features, as Professor Ramsay points out, are referred to in the letter to the Church of the Laodiceans (Rev. iii. 14–18). Amongst the many interesting remains of the old town are those connected with the water-supply, including an inverted stone syphon, similar in construction to the syphons at Patara, and near Jerusalem, by which the water was carried across a valley. A sketch is given of the great Zenonid family, one of whom, M. Antonius Polemo, "addressed cities as his inferiors, emperors as by no means his superiors, and the gods as his equals." Many curious details will be found respecting the religion, games, and dress of the people, and of the various officials and municipal authorities who managed the affairs of the city.

In describing Hierapolis, the "Holy City," special attention is naturally drawn to its religious character, and to the hot springs whose remarkable deposits are visible from nearly every point in the valley. Professor Ramsay makes a happy suggestion that the Ploutonion—a hole reaching deep into the earth, from which issued a mephitic vapour

—was deliberately filled up and covered over by Christians, who believed it to be the very dwelling-place of Satan. Equally happy is the view that the "Brotherhood of Youths," mentioned by Ibn Batuta, had its origin in the *Xenoi Tekmoreioi*, or "Guest-friends who use the sign." The trade guilds, mentioned in the inscriptions of Hierapolis, date from a very early period of history, and have survived to the present day, especially amongst the Armenian population of Asia Minor.

One of the most interesting chapters is that dealing with the cities in the Middle Mæander valley. In this, one of the richest districts of the interior, fifteen cities, towns and villages, are now placed, where only one was known before. The inscriptions found here have supplied much new and valuable information on the social life of the people before they were completely Hellenized, and on the habits and customs of the priests and other persons who lived in the sacred villages near the great *hiera* of Asia Minor. In connection with the sacred animals, attention is called to the fact that they were the animals of a pastoral people, and that all, excepting the sheep, appear in the Hittite hieroglyphs. From this latter fact, Prof. Ramsay infers that the hieroglyphs originated in the vast level, treeless plains of Asia Minor. He has also adopted the view that Khitasar, the Hittite monarch who fought with Rameses II., was the ruler of a great empire, having its capital at Pteria. This view will probably turn out to be correct when the mounds of Northern Syria have been excavated, and more light is thrown on the Hittites and their empire.

It is interesting to find that so many traces of the old village system, as described in the text, have survived to the present day. Each village has still, in some measure, its separate individuality and administration; and its own territory held to a large extent under the communal system. Many of the more valuable inscriptions have been found in the obscurer districts of Asia Minor, and some of those of the Middle Mæander valley have supplied a word that has a peculiar interest in connection with the letters of Ignatius.

After noticing the Phrygian cities of the Lower Mæander valley, Prof. Ramsay describes Colossai, which in early times was the great city of the Lycos valley. Colossai gradually declined as Laodiceia rose to importance; and the stories of the gradual removal of the Colossians to Khonai, on a lofty spur of Latmos, and of the destruction of the great church of St. Michael by Seljûk Turks under the leadership of a Greek renegade, are well told. The questions connected with the accuracy of Herodotus' description of the Lycos gorge, which were discussed in the author's 'Church in the Roman Empire,' are again briefly noticed. There is no reason to believe that the Lycos ever flowed for five stadia in an underground channel in the immediate vicinity of Colossai; and the explanation given that the real source of the river is in Lake Anava, whence it runs underground to Kodja Bash, appears to

be correct. In connection with Colossai, there are good descriptions of the old Eastern Highway, and of the later Byzantine road to the east, which, instead of following the old road to Apameia, turned north to the Mæander valley, near Siblia, and crossed the hills beyond it by the *Duz Bel.*

Some of the most interesting passages in the book are those that relate to the imperial estates in the Killanian plain. These estates were farmed to contractors, and were managed by a procurator who was an imperial freedman, and managers who were imperial slaves. The land was cultivated by the natives, who paid rent for their farms. The procurator, who represented the imperial authority, maintained public order by a corps of police, and marked and preserved the boundaries of the properties. The estates appear to have belonged to the Pergamenian kings, from whom they passed to the Roman emperors. At a later period they came into the hands of a branch of the imperial family, and they seem to have been owned by the Annia Faustina who married the Emperor Elagabalus.

It may be added that each chapter of Prof. Ramsay's book is followed by appendices, containing the more important inscriptions in the district described, lists of the bishops, and discussions on disputed points. There is also a clear map, showing the natural features and the ancient sites in South-Western Phrygia. In transliterating Turkish words, the adoption of the French form *dj* for *j*, and *tch* for *ch*, is, we think, to be regretted.

Prof. Ramsay's 'Local History of Phrygia' will, we venture to think, when completed, be the most important work of the kind that has been published in this country in recent times; and the thanks of geographers and scholars alike are due to the delegates of the Clarendon Press for undertaking its publication.

M. MARCEL DUBOIS ON COLONIAL SYSTEMS AND COLONIZING PEOPLES.*

By G. G. CHISHOLM, M.A., B.Sc.

THIS work is in a large measure avowedly polemical. It is called forth by the author's conviction of the erroneous nature of some of the views expressed, more particularly of M. P. Leroy-Beaulieu in his 'History of Modern Colonization,' as well as of Seeley and his French translator M. Rambaud. M. Dubois wishes especially to protest against the current belief that the French are not a colonizing nation, and that their failure is due, like that of many other nations, to the inferiority of their methods as compared with the liberal policy to which England owes her success

* 'Systèmes Coloniaux et Peuples Colonisateurs. Dogmes et Faits.' Paris: G. Masson, 1895.

in colonization. M. Dubois maintains, on the contrary, that the French are eminently a colonial people; that they have even found out the mode of expansion truly useful to their country and truly moral (*vraiment moral*); and as regards the liberality of the English policy—held up, he says, especially by some of his own countrymen as an example to the French—he asserts that such liberality as England has shown was forced upon her by circumstances, and that, historically, the French were in advance of the English in the application of liberal ideas to colonial management. Originally, English colonization was carried out from exactly the same motive as that which animated other countries—the desire to secure a monopoly of trade. Self-government was granted to some of our colonies only to avoid a similar secession to that by which we lost the United States.

These and other ideas are developed in a series of chapters in which a sketch is given of the colonizing efforts of all the leading colonial nations of modern times, beginning with Portugal. The territorial expansion of Russia is treated from the same point of view in one chapter, and that of the United States in another headed "Colonies of Colonies." These chapters are all very interesting, and are crowded with just remarks, though a good deal is demonstrated with somewhat of the air of discovery that is pretty obvious to all students of colonial history.

We are glad to see that this volume is only a preliminary survey of the question, issued now because the author believes that a protest against current ideas is urgently required, and that he hopes afterwards to present the results of his studies to the public in a more rigorous form, in which his theses shall be supported by documents and proofs. That being so, it may be of use to direct attention to certain oversights or doubtful statements that it would be well to examine before the more extended work is issued. Perhaps the most curious of the oversights is the enumeration (p. 118) of the Channel Islands among the annexations of England between the peace of Utrecht and 1815. In the Channel Islands it is not forgotten that such annexation as there was took place the other way and at a much earlier date.

That, however, will mislead no one; but there are some other statements that require more attention. M. Dubois again and again insists that the population of the United States is not English in origin in so large a proportion as we are apt to suppose. On p. 108 he says that down to 1640, when emigration was arrested or slackened in consequence of the cessation of religious persecution in England, only from 25,000 to 30,000 exiles crossed the Atlantic, and that, as in 1660 there were nearly 200,000 Europeans in the American colonies, it may be assumed (*il est permis de croire*) that the English then did not form the majority, but that already they were becoming fused with Irish, Dutch, Swedes, and French into a new family. We hope that in the more extended work the grounds for this assumption will be given.

Speaking of New England only, Seeley ('Expansion of England,' p. 71), citing Hildreth's 'History of the United States,' states that the immigrants to that region down to 1640 were not more than 25,000, and that after that date the immigration was balanced by emigration "or dispersion"; but he adds that from these 25,000 are derived not less, perhaps, than one-fourth of the present population of the United States, leaving us to suppose that the net gain from the early immigration into the American colonies from all quarters subsequent to 1640 did not count for much. But Charles Davenant, one of the most careful statistical investigators of the seventeenth century, writing in 1698, states that for the past eighty years the plantations are admitted to have carried away in ordinary years about 1000 persons. He is estimating the loss of England alone by emigration, and if there is any truth in this estimate, it should be taken into account in such calculations.

Further on (p. 117) M. Dubois states in a note that the great stream of emigration to the United States, begun in 1815, has not been exclusively English. That, of course, is quite true, even if English be taken to include Irish; but M. Dubois adds the extraordinary and of course utterly erroneous statement, that between 1821 and 1881 the number of Italians that went to the United States was three times as great as that of the English. Again, speaking of the concentration of the population of the United States in towns, M. Dubois (p. 200) states that in Illinois, Chicago absorbs the whole of the increase of the population. Well, it is true that between 1880 and 1890 the great bulk of the increase of the state of Illinois belonged to Chicago, but the very rough way of stating this adopted by M. Dubois conceals facts worthy of careful consideration. The truth is, that during the same period the increase of population in Illinois, apart from Chicago, was about 150,000 on a total initial population of 2,575,000, equal to an annual increase of 5·7 per 1000, more than three times the rate for the same period in France, urban and rural population included.

DR. SVEN HEDIN IN CENTRAL ASIA.*

[THE following has been received from Dr. Sven Hedin, under date "Kashgar, October 20, 1895."]

I will briefly relate my proceedings during the past summer. On July 10, I started *viâ* the village of Upale to the Ulug-art pass over the Kashgar range (Mustag), which proved the most difficult of all the passes that I know. Water boiled at 83·69° C. (172·66° Fahr.), with an air-temperature of 1·8° (35° Fahr.), snow falling at the time. It is not the altitude, but the nature of the ground which makes the pass so

* A further long communication has been received from Dr. Hedin, which will be published in an early number.

difficult; both slopes are excessively steep and abrupt, especially that to the west, which resembles a rocky ladder covered with snow. All the goods were carried by Kirghiz, in spite of which we had the greatest difficulty in getting our horses across, and lost one, which fell down a precipice. On the other side, to the left of the pass, there is a fine glacier, which has closed up three small valleys on the right, and thus brought about the formation of three small but picturesque lakes with green water. We afterwards proceeded to the Kirghiz *aouls* of Mutji, a place in the northern part of the great valley of Sarik-kol, and not far, in a southerly direction, from the Kara-art pass, which forms the water-shed between the Sarik-kol and Markan-su.

I then turned towards the south, in order to make a thorough study of the lake of Tiaker-aguil, which is placed almost opposite the beginning of the narrow valley of Gez. The lake is situated at the mouth of a valley, which has apparently been blocked up by the dust and sand, which is transported in large quantities by the east winds which blow up the valley of Gez. My intention was to examine the glaciers which exist in the chain of mountains between Gez and Mustag-ata, but the weather was so unfavourable that any ascent was out of the question. Even in the valley of Sarik-kol there was incessant snow and rain. We therefore continued southwards by Kara-kul and Ulug-rabat to Tagarma. Mustag-ata disappeared in the clouds, and became covered with snow down to its base. The climate was entirely different from that of the previous year.

At Tash-kurgan I had the pleasure of meeting Mr. Macartney, and we visited the village and fortress together. These had been shattered by the violent earthquake shocks which assailed these parts from the 5th to the 20th of July. The most powerful shock took place on the 5th, and was accompanied by tremendous reports. All the inhabitants (stationary Tajiks), as well as the Chinese workmen, remained in tents and *yurts*. Not only were the constructions of man ruined by this earthquake, but even the mountains felt the effects. When I subsequently passed by the narrow valley of Shindeh, I was able to observe how this passage, which is enclosed here and there by perpendicular rocks, was filled with enormous blocks and *débris*, amongst which it was necessary to thread one's way. The road between Ilik-su ("Tepid water;" not Ili-su, as Younghusband writes it) and the Raskan-darya had suffered in like manner, and, according to the Tajiks, it was only possible to pass on foot.

In company with Mr. Macartney, I proceeded *viâ* Iergal and Defter to Shojet-bai, where the river of Shunserab unites with that of Kara-tiukur to form the Tagdumbash-darya. Then I visited the sources of the Shunserab in the elevated valleys of Uprang, Ulug-tur, Shunserab, Kara-su, and Ilik-su; and in order to determine the altitudes and make some geological observations, I ascended the three passes of Shunserab,

Uprang, and Ilik-su. I have not time to write now on the observations which I made. Thence I took the road by Kara-tiukur, and crossed the pass of Vakjir, in the vicinity of which, especially from the faces of the great glaciers of the Hindu-Kush, lie the sources or true origin of the Amu-darya. Nevertheless, the Tiakmakden-kul is generally regarded as the source of the Amu. In fact, there is a small valley, Chil-ab, on the south-west side of the lake, whose stream bifurcates in such a way that half the water flows to the Tiakmakden-kul, and the other half to the Penj. But certainly the most important streams—that is to say, the Penj and its tributaries, especially that of Vakjir—ought to be considered the true source, particularly as the altitude from which they spring is almost double that of the Tiakmakden-kul.

On my descent of the valley of the Upper Aksu, I passed the mouth of the small valley of Mehmaniolli, where the Commission for the delimitation of the frontier was encamped at the moment. Thanks to the boundless hospitality of the two commanders, Messrs. Gerard and Pavalo-Shveikovsky, I remained there three weeks. The most friendly and cordial relations possible existed between the two camps. Colonel Holdich and I made an appointment at the R.G.S. for this time next year.

I made an interesting journey back to Kashgar from Tash-kurgan. I followed the route across the chains of mountains which form the geographical frontier of the Pamir plateaux, and thus crossed the passes of Beldir, Kandahar, and Arpa-tallak. Having also crossed that of Shindeh, I have been able to draw a geological section of all the chains bordering on the Pamir. The route is very difficult, especially the passage of the Raskan-darya, or river of Tong (the upper Yarkand-darya), which is a large stream even at this season. At Tong the rapidity of the current is such that the river can with difficulty be crossed, with the help of inflated goat-skins (*tulums*). From Tash-kurgan to the foot of the mountains the population is exclusively composed of Tajiks. Nevertheless, it is curious that geographical names in the Turki language are by no means rare. From Kusherab, where the Yarkand-darya is once more crossed, I made my way direct to Kashgar by way of Yangi-hissar.

Now, having finished the description of my journey in the desert, I am engaged in preparations for that towards the East. I shall send my caravan hence to Kizil, whilst I shall go myself once more to Urdan Padishah to examine the small mountains which are found between that place and Kizil. Then I shall take the main road to Khotan, whence it is my intention to make an excursion to the Mazar-Tag. If time should permit, I should like to attempt the discovery of the ruins of an ancient town which, according to information received, is to be found at some days' journey from the river in the direction of the Keria-darya. We do not know much of the plateaux of Northern Tibet, south of the

Kuenlun, and between the meridians of Lob-nor and Keria. Both General Pievtsof and Captain Grombchevsky experienced great difficulties there. I will make an attempt to penetrate in that direction during the winter, perhaps the only season in which a visit to these arid countries is possible. Thence I hope to return to Lob-nor to examine the swamp and its neighbourhood. There I shall do my best to obtain information as to the Littledale expedition, of which I have not heard since its departure for Cherchen.

For the journey to China proper, I shall probably proceed by way of Mongolia. I hope *en route* to have an opportunity of collecting some information concerning the revolt of the Dungans. The cause of this rebellion is uncertain, though it much resembles the former one (*vide* Letter of Baron v. Richthofen, No. vi., 'On the rebellion in Kansu and Shensi.' Shanghai, 1872). Nevertheless, it would not be surprising if the Mohammedans were still bolder this time, owing to the Chinese misfortunes, and the weakening of their forces since the war. Even here at Kashgar we have experience of the efforts made by the Chinese. Not long ago the greater part of the garrison of the place was despatched to Aksu, to be sent on to Kansu, the seat of the war. Dao-tai himself has announced that the revolt is approaching these regions, and that the insurgents mean to invade Turkestan by way of Aksu and Khotan, and also (it seems) by Lob-nor and the Tarim.

THE MONTHLY RECORD.

THE SOCIETY.

Mr. St. George Littledale.—Mr. and Mrs. Littledale have arrived in England, and we are glad to learn that Mrs. Littledale's health is not so bad as was feared; with due care it is hoped she will soon be quite strong again. Mr. Littledale will give an account of his remarkable journey across Tibet, to within 40 miles of Lhasa, at the meeting of the Society on Monday, February 24. He has brought home a detailed map in many sheets, constructed day by day from his own observations, often under conditions of the most trying kind.

EUROPE.

Lakes in the Basin of the Lech.—A contribution by Dr. W. Halbfass to *Pet. Mitt.*, No. X., 1895, contains the results of a number of observations made by him as to the depth, temperature, and transparency of a number of lakes in Bavaria and the Tirol in the basin of the Lech. In the table below, which may be compared with that relating to the English Lakes on p. 162 of vol. vi. of the *Journal*, the dimensions of the principal lakes on which observations were made are given in English measures:—

Name.	Greatest Length.	Greatest Breadth	Circumference.	Depth in feet.		Height of lake-surface above sea.	Area. Square miles.	Volume. Million cubic feet.
	Miles.	Miles.	Miles.	Maximum.	Average.	Feet.		
Bannwaldsee	—	—	—	37·7	21·0*	2598	0 81	475
Hopfensee ...	1·61	1·04	4·19	36·4	17·7	2608	0·68	336
Weissensee	1·78	0·57	3·67	82·0	44·3	2615	0·50	615
Alpsee ..	1·40	0·60	2·92	193 6	84·6	2652	0·45	1056
Haldensee ...	1·17	0·55	2 33	68·9	47·2	3688	0 37	484
Vilsalpsee ...	1·17	0 48	2·17	88·6	47 9	3832	0·27	364

Finland.—A volume entitled, 'Exposé des Travaux Géographiques exécutés en Finlande jusqu'en 1895' (Helsingfors, 1895), consisting of 154 pages, was prepared as a communication to the Sixth International Geographical Congress (London, August, 1895). It is composed of a series of sections by different writers, giving a brief account of the works connected with the geodesy and astronomical geography, cartography, topography, geology, hydrography (both of the coasts and the interior), meteorology, terrestrial magnetism, botanical geography, zoological geography, phænology, statistics, industrial and commercial geography, historical and ethnographical geography, and ethnology of Finland, preceded by an introduction relating to the general treatises on the geography of that country. The topographical survey of Finland has been in progress since 1870, at the expense of the Russian government, to which, however, the government of Finland decided in 1886 to contribute an annual subvention of 29,000 marks for fifteen years. In 1895 the survey of the country south of 61° 6′ N. was completed, with the exception of the sheets to the south of Keksholm and the region adjoining Lake Ladoga, and the thirteen sheets between Villmanstrand and Keksholm from the parallel of 60° 54′ to that of 61° 6′ N. Under the head of hydrography a list of the canals of Finland is given, with the dates of their construction, and in some cases the depth of the locks. Under that of industrial and commercial geography, a few paragraphs are devoted to the rapid growth of the dairy industry, and the consequent increase in the export of butter in recent years, especially since the introduction of centrifugal machines and separators. The development of the export trade has been particularly rapid at Hangö since 1887, when a large ice-breaker was brought into use to keep the traffic constantly open in winter. The total export of butter from Finland increased pretty steadily from 5·5 millions of kilos. in 1886 to 9·6 millions in 1893, and then suddenly rose to 13·3 millions in 1894, and of this total the proportion exported by way of Hangö increased from 12·9 per cent. in 1886 to 84·9 per cent. in 1894.

ASIA.

Prince Henry of Orlean's Journey from the Mekong to Assam.—General J. T. Walker communicates the following note on this subject :—The *Times* correspondent in Calcutta gives the following account of this journey: "Further particulars of Prince Henry of Orlean's journey show that 1600 miles of new country have been traversed. The source of the Irawadi has been fixed about 30 miles north of lat. 28°, between long. 98° and 99°. The main stream is known locally as the Taurong, which becomes the Hmaikha of British geographers. Eleven streams in all drain from the mountain range south of Tibet, three of which are longer than

* Estimate.

the others; the Taurong, which is the longest, with most water, lies farthest east. The valleys of the Mekong, the Salween, and the Taurong are separated by high ranges, which prevent any possible connection, each flowing separately on its course. The prince and his two companions crossed seventeen ranges between Tsikon, on the Upper Mekong, and Sadiya, in Assam. Some of these were 13,000 feet high, while the adjacent ranges showed peaks much higher. The party, which originally started from Tongking, left Ta-li-fu in the middle of June, and reached Tsikon early in September, the Khamti country at the end of November, and Sadiya at Christmas. It had no escort throughout, and no collision with wild tribes occurred. The route was most difficult from Tsikon, a coolie transport having to be employed." From the above account it is obvious that Prince Henry has made a most notable journey, and has probably solved the riddle whether the Lu river of Tibet is the source of the Irawadi or of the Salwin. It is said that the source of the Irawadi has been fixed in lat. 28°–30°, between long. 98° and 99°; that this is the longest and easternmost of the streams flowing into the Irawadi from the mountain range south of Tibet; and that it is locally known as the Taurong, and enters Eastern Burma under the name of the Meh Kha. The source of this river is shown exactly as here described in the map attached to the *Proceedings of the Geographical Society* for June, 1887; but lower down it is made to join the Lu river of Tibet at Chamutong, and then trend south-westwards into the Meh Kha. But if the Taurong is the principal source of the Irawadi, it cannot be an affluent of the Lu river, and must be the upper source of the Fungmai river, which lower down becomes the Meh Kha; in this case the Lu river must be the source of the Salwin. Full information on this subject will doubtless be forthcoming when the details of Prince Henry's journey are published. The circumstance that the hill ranges between Tsikon, on the Upper Mekong, and the Khamti country should have been traversed without any escort, or any collision with the wild tribes occupying them, is very remarkable, being quite the reverse of the experience of the travellers who have hitherto attempted to make the same journey, but in the opposite direction. It is highly creditable to Prince Henry, as a judicious traveller through regions occupied by barbarous tribes, whom it is essentially necessary to make friends of and conciliate.

Navigation of the Mekong.—Repeated attempts have been made by the French in recent years to overcome those obstructions to navigation which induced Francis Garnier, on his return journey from the expedition of 1866–68, to pronounce the Mekong useless as a waterway. These obstructions consist in difficult rapids from Sambok to Sambor above Kratie, a series of impassable cataracts below Khon in about 14° N., and another series of dangerous rapids extending over a stretch of about 50 miles below Kemmarat. Above these the river forms an excellent waterway as far as Nongkai, and sometimes even to Viengshan, where it issues from the calcareous mountains that cover the north of Indo-China. The 44th number of *Le Tour du Monde*, 1895 (November 2), gives an account of the progress recently made in surmounting these obstructions. In 1889, M. Heurtel, frigate captain, took the first sea-going vessels up to the falls of Khon. In 1893 steps were taken to transport vessels to the navigable waters above these falls by means of a railway through the island of Khon, and before the close of the year the transport of the *Ham-Luong* and the gunboat *Massie* was successfully accomplished. In February, 1894, the *Massie* managed with great difficulty to steam up the rapids of Kemmarat, six days being required for the passage, and on August 15 it reached Viengshan. On September 5, in the same year, the gunboat *La Grandière* was also conveyed across the island of Khon, and in November it also passed the rapids of Kemmarat. Meanwhile Captain Robaglia, in the early part of 1894, made a survey of the Mekong

below the falls of Khon, and ascertained that it could be made navigable all the year round down to Saigon for vessels drawing 6½ feet.

A Journey in Western China.—Mr. A. von Rosthorn, a member of the commission appointed to open the port of Chungking to foreign trade (1891), describes, in a paper read before the Geographical Society of Vienna, a journey which he made in the autumn of the same year, partly over new ground, in the north-west of the province of Szu-chuan. He proceeded from Chungking to Chengtu-fu by the usual route, and thence to Kwan-hsien, at the head of the irrigation works by which the waters of the Min are distributed over the plain of Chengtu-fu. Kwan-hsien was visited by Captain Gill in 1877, when he made what he called a loop in the mountains to the north of the Chengtu-fu plain, as to which he gave out the conjecture that it was formerly the bed of a lake. On this point, according to Von Rosthorn, tradition and history leave no room for doubt. Von Rosthorn first points out that the bifurcation of the Min at Kwan-hsien is clearly artificial. Traditionally, the plain of Chengtu-fu is said to have been at one time a *lu-hai*, which, says Von Rosthorn, can only mean a lake or a swamp. And, further, the Chinese annals of the period of the Chin, the period in which these annals begin to be trustworthy, ascribe the origin of the works by which this lake or swamp was drained to one Li Ping, the first governor of Shu, who entered on his office about 250 B.C. The irrigated plain of Chengtu-fu would thus be, at least, in part upwards of 2000 years old. At Kwan-hsien the new part of Von Rosthorn's journey began, his route being from this point for the most part westerly. The new ground traversed lies to the north-west of a line drawn from Kwan-hsien to Tachien-lu and south of 31° 40′. Most of this region forms the administrative district of Chinchuan, or Moukung, which is separated from that of Wenchuan on the east by the Palang-shan range (altitude of pass about 15,000 feet). The district of Chinchuan is composed of the basin of the river of that name—a Chinese name, meaning "gold-stream," for the upper part of the Tung, or Tatu-ho, known to the tribes of the district as the Chiachu-ho, or the Tsuchin (see map in *Proceedings R.G.S.*, 1886, p. 416; and Baber, 'Travels and Researches,' p. 94). The whole region is composed of mountain ranges with narrow intervening valleys. The prevailing rock is granite, which appears on the surface chiefly in the higher parts; the sides of the valleys, and above all the main valleys, which have a north-to-south trend, being formed principally by precipitous slate formations, which leave little room for cultivation at their base. The native tribes, Tibetan Lamaists, are chiefly found in the side valleys and on the higher parts of the mountains, where they cultivate barley, wheat, and buckwheat up to the height of 12,000 feet. Until the latter part of last century, these tribes were under the rule of independent chiefs; but in 1776 they were conquered by the Chinese, after a war of some years. The Chinese carry on the government in a conciliatory spirit, recognizing the influence of the lamas, and making every effort to secure their favour. They have made many attempts to colonize the region, but with little success. Except in the military posts, which are established beside each of the great lamaseries, the Chinese are found principally as traders, innkeepers, and porters, and hence confined to the main routes in the sparsely inhabited main valleys. Von Rosthorn, it may be mentioned, rejects Baber's name of Hsifan (Sifan) for the tribes of this region, as not being current locally; but it may be pointed out that Baber suggests the name only as "occasionally used," and as having "no very depreciatory meaning" ('Travels and Researches,' p. 93). The name generally used, according to Von Rosthorn, is Man-chia, or Man-jên, which, he says, is free from the objection to which the general term of contempt, Man-tse, applied by Chinese to native tribes generally, is liable, the offensiveness of the latter designation lying wholly in the termination.

Proposed Connection of Assam-Burma Lines.—A fresh expedition, this time from the Indian side, is examining the passes over the Patkoi range between Assam and the Hukong valley, and expects to join the survey party from Mogaung (referred to at p. 93 of the *Journal*) about February 1. The Assam expedition is a large one, consisting in all of about five hundred people, including escort, surveyors, and camp-followers. Their object is to reconnoitre the best route for a connecting-line between Makum and Mogaung, or, in other words, to prepare the way for linking the Assamese and Burmese railway systems. Mr. Way, C.E., is engineer-in-chief, and is assisted by Mr. Wallace and Mr. McIntyre, and Captain Swayne as intelligence officer. Mr. Way has already surveyed other likely routes, and it is said that the Patkoi range offers fewer obstacles than the hills of Manipur and Chittagong, a conclusion which is corroborated by the reports of previous explorers over the Patkoi mountains. The country about here is very unproductive, and inhabited by tribes who have very vague notions of their obligations to the British Government. Everything has to be conveyed by coolies, as roads do not exist, and the jungle paths are difficult and infested with leeches. Three hundred and fifty coolies were collected in Shillong and sent to Margherita (Diheng Bridge), and by November 4 a camp had been pitched on the top of the Patkoi, over 4000 feet high, and, the jungle round having been cleared away, the country below lay revealed like a map. Mr. McIntyre started about the same time to reconnoitre the passes east of the Non-yong lake. It was hoped that in a few days heliographic communication with Sadiya, where there is a telegraphic office, would become possible. In the mean time, the Mogaung column, who appear to have had difficulties with the Kachin tribes, are working their way westward, and news of the junction of the two parties ought to arrive at almost any moment.

AFRICA.

Old Map of Africa.—Dr. Carl Peters has lately issued a pamphlet (Berlin: Dietrich Reimer) describing an old map of Africa found by him in a historical atlas published at Amsterdam between 1705 and 1719, on which he founds a fresh argument in favour of the idea, so often brought forward, that the interior of the continent was definitely known to the Portuguese in the early days of their colonies on the East and West Coasts. The points on which he lays most stress are: (1) that a race of dwarfs, named Bakke Bakke, are shown as inhabiting a forest region north-east of a northern bend of the Congo, as drawn on the map; (2) that the information as to the gold-mines south of the Zambesi coincides remarkably with what is now known of those regions. In view of the unquestioned fact that such gold-mines were worked in very early times, it is by no means improbable that the Portuguese possessed some knowledge of them at the time of their greatest prosperity in Africa; it is also quite possible that some rumours of dwarfs living in a forest region in the interior reached them through other native tribes. But it requires much more definite proof to suppose, as Dr. Peters is inclined to do, that accurate knowledge of the hydrography of Central Africa had been obtained at that date. A common characteristic of the maps of the sixteenth and seventeenth centuries, is that the known features in the vicinity of the coasts are pushed far into the interior, so that we actually find some Abyssinian names closely approaching those belonging to the interior of Angola. This fact goes far to explain the hydrography of the Amsterdam map, which, though wanting the common lake-reservoirs of the Nile and Congo shown by Pigafetta and others, reproduces many of the usual features of those maps. As regards the Congo, it may be pointed out: (1) that the Koanza, quite a second-rate stream, is given an equally remote source in the interior; (2) that the upper course is marked on the map "Coango," and that the town of "Casangi" occupies,

relatively to its left bank, the same position that the modern town of that name does to the Kwango, which would therefore seem to be the stream indicated. Other points which tell against the supposition of accurate knowledge are the avowed uncertainty as to the origin of the Zambesi, and the fact that the lake indicated in the eastern half of the continent is said to be placed merely according to the report of the negroes; also that an important river, coming from the far interior, is made to debouch between Melinde and Mombasa, which shows an equal exaggeration of distance with that noted in the case of the Koanza and Kwango.

Explorations by Officials of the Congo State.—Further details of the explorations of Captain Nilis and Lieut. de la Kéthulle between the Welle and Darfur (*Journal*, vol. v. p. 81) are given in the *Mouvement Géographique*, 1895, No. 24, accompanied by a good map showing their various routes. From this it will be seen that much light has been thrown by these travellers on the hydrography of the regions traversed, especially with regard to the Shinko, a northern tributary of the Mbomu, which was crossed at various points and explored almost up to its sources. The supposed course of the Kotto, the headwaters of which were crossed by the travellers on their march to the confines of Darfur, is also shown on the map. This river, which joins the Welle-Mobangi below the confluence of the Mbomu, will apparently be one of the most important northern tributaries of the stream, having its sources north of 8° N. lat., and thus forming the most northerly extension of the Congo basin. The expedition does not appear to have added much to our knowledge of the headwaters of the Bahr el Fertit, known previously from the scanty information supplied by Colonel Purdy and Dr. Potagos, having only just crossed the watershed before reaching its furthest point. For this section of the journey, however, further details are promised. Some interesting information is given with reference to the political relations of the tribes of this region, and their powerful sultans Bangasso and Rafai, as well as of the invasion of the famous Rabah. The succeeding number of the *Mouvement* (No. 25) gives some information as to the voyage of Delcommune up the Ruki in 1889. It appears that that officer explored in that year, without being aware at the time, a southern tributary of the Búsira named Salonga, which had not been seen by Grenfell and von François. It has since been further explored by M. Thierry. The courses of the various tributaries of the Congo which unite with the main stream near the equator are shown in a clearly drawn map in the same number, intended to illustrate the theory of M. Wauters that this region, now remarkable for its fertility and luxuriant vegetation, formed the lowest depression of the ancient inland sea, which was drained seawards by the formation of a passage through the coast ranges. The map also shows the channel of Ukaturaka, the longest of the diverging channels which branch off from the main stream between Stanley falls and Bolobo, concerning which some extracts are given from the journal of Delcommune, who surveyed it in company with Captain Martini in 1888.

Districts of the Congo State.—By a decree of July 17, 1895, a modification has been introduced into the administrative subdivision of the Congo state, according to which the number of separate districts now amounts to fifteen, not including that of Lado, leased from Great Britain. The first division into districts took place in 1888, when eleven were formed, and since that date modifications have been from time to time introduced in order to make the boundaries agree better with the actual circumstances of occupation. The boundaries are clearly defined in the *Mouvement Géographique* (1895, No. 23), besides being shown on a map. The largest district is that of Stanley falls, which includes the whole area from the Lomami to Lake Tanganyika. In the more settled parts the areas are much smaller. Many of them are of very irregular shape, being arranged principally on

the basis of accessibility by the various waterways formed by the main river or its tributaries.

New Route to Lake Mweru.—The *British Central Africa Gazette* has lately published (September 15, 1895) the account of a journey made by Mr. P. Weatherley from Lake Tanganyika to Lake Mweru, by a route through the Awemba country, to the south of those usually followed. It seems, in fact, to have led in part through districts not previously traversed by Europeans, although it must have crossed and recrossed Livingstone's route on his last journey to Lake Bangweolo. Leaving Chungu's boma in Ulungu on July 6, 1895, Mr. Weatherley struck west and then southwards, crossing the Luvu (Livingstone's Lofu) and several of its tributaries, and following what he describes as a perfect path through a beautiful and rich country. The scenery on the various hill streams passed roused the traveller's enthusiasm, especially that of the Mkotwe, a tributary of the Luvu, up the narrow valley of which the path led. On the top of the plateau, from which the stream flowed, a splendid path traversed alternately park-like scenery and thick bush, the country being described as the most magnificent seen by the traveller in Central Africa, and stretching away to the south-west in gentle undulations abounding in wood and water. The air was bracing, the thermometer falling to 55° Fahr. at 7 a.m. This part of the route diverged southwards from the direct way to Lake Mweru, in order to allow of a visit to the powerful Awemba chief Mporogoso, with whom Mr. Weatherley succeeded in establishing the most friendly relations, and of whose intelligence, sobriety, and dignified bearing he speaks in glowing terms. Mutilation as a punishment for trivial offences seems however still as prevalent in his dominions as it was in Kazembe's in Livingstone's time, and people who had lost eyes, ears, nose, or fingers were seen on all sides. The Awemba country is divided between three principal chiefs, Mporogoso to the west, Mwamba to the south, and Kitiamkulu to the north-east. The last-named (Ketimkuru of Giraud, who visited his predecessor) was originally the head-chief of the Awemba, but the other two have gradually strengthened themselves at his expense, and owing to the obstructive tactics against the whites which he has pursued, Mr. Weatherley considers it desirable that his rivals should combine to drive him out. Leaving Mporogoso's hospitable boma, which is situated within the basin of the Loangwa, a clear stream tributary to the Kalungwizi, the traveller proceeded north and west, crossing many streams, one of which was bordered by 600 yards of black mud (recalling Livingstone's accounts of the "sponges" of this region). A descent was made from the plateau by two successive steps, from the higher of which a splendid view to the west was obtained, the scenery continuing most beautiful, and becoming gradually more wooded. Game, if present in any quantity, was concealed by the length of the grass, in which it was difficult to find a path. At last, however, Chikwekwe's village, in Itawa, was reached, after which the rest of the way to Mweru was through a country often traversed before.

AMERICA.

The Great Lakes and Niagara.—For some years Dr. J. W. Spencer, of the Great Lakes Geological Survey, has been studying the raised beaches above the present shores of the Laurentian Lakes.* He believes in their marine origin, their formation taking place when the lakes were part of a great arm of the sea. The terraces, however, are inclined to the present water surface of the lakes, and are higher in the north than in the south, in the east than in the west. The uplifts that

* 'Eleventh Report Commissioners N.Y. State Reservation at Niagara.' Albany, 1895.

produced these deformations in the Earth's crust also caused the separation and elevation of the Great Lakes. Lakes Superior, Michigan, and Huron communicated with the sea first by a strait, then by a river passing by Lake Nipissing and the Ottawa valley. The waters of Lake Erie 32,000 years ago were also at the same level as those at the other side of the Niagara isthmus, but the falls began 1000 years later, as the land continued to rise until it was 80 feet higher than now; and 8000 years ago the outflow of the upper lakes was deflected to the present channel by the St. Clair channel, and increased the volume of the Niagara river. The raising of the waters of Ontario 80 feet brought about the present conditions. The basis of this estimate of 31,000 years as the age of Niagara falls is derived from the mean rate of recession in 48 years, as measured from two surveys. Such estimates as that of 9000 years are due to a neglect of the changes in elevation and in volume of the Niagara river that have occurred since its formation. An elevation of 70 feet in the Niagara district would send the waters of the lakes to the Mississippi by Chicago, and in the present mean rate of rise this should happen in 5000 or 6000 years. Dr. Spencer's calculations place the end of the ice age at least 50,000 years ago.

Bolivia-Paraguay Frontier.—In *Petermanns Mitteilungen*, 1895, No. XI., Dr. H. Polakowsky, besides furnishing various statistical data regarding Bolivia, gives particulars as to the frontier between that republic and Paraguay as settled by the treaty of August 28, 1895. The new frontier begins on the Paraguay 15 kilometres north of Fuerte Olimpo (which stands in 21° S.), and runs thence west and somewhat south to the point where the meridian of 61° 28′ W. touches the left bank of the Pilcomayo. The territory south of that line between the Paraguay and Pilcomayo is to belong to Paraguay, that to the north to Bolivia. Paraguay thus receives from Bolivia a considerable portion of the departments of Chuquisaca and Tarija, as drawn in the last edition of Stieler's Hand-atlas, and surrenders to Bolivia a comparatively small angle in the north-west of the Paraguayan Chaco.

AUSTRALASIA AND POLYNESIA.

Explorations in Celebes.—Since the end of 1893, two cousins, Fr. and P. Sarasin, have been making explorations in Celebes with remarkable success. Their first two journeys were in the north-eastern peninsula; the third and most important was across the core of the island from south to north (Gulf of Boni to Gulf of Tomini) in the early part of 1895. The water-parting between north and south is formed by the Takalekajo mountains, which were crossed at the height of 5480 feet. They are covered with dense forest, the passage of which occupied three days. From these mountains the explorers descended to Lake Poso, which they found not to be a crater lake, as had previously been thought, but to occupy a deep tectonic fissure. The surface of the lake is about 1650 feet above sea-level. Near the middle no bottom was found at a depth of 1000 feet, and even near the shore depths of 250 and 350 feet were ascertained. Subsequently the explorers made an attempt to cross the upper end of the south-western peninsula, starting from the bay of Mandar, on the straits of Macassar, but in this attempt they were foiled through the opposition of a native chief. A full account of these latter journeys, with a map (1: 1,000,000), appears in the *Zeitschrift* of the Berlin Geographical Society, 1895, No. 4.

POLAR REGIONS.

An Expedition to the Antarctic.—A commercial syndicate in London has obtained funds sufficient to send an expedition next autumn to Victoria Land for the purpose of whale and seal fishing. It has, we are informed, been arranged that, for a payment of £5000, a party under charge of Mr. E. Borchgrevink will be taken

on board the vessel which is to be equipped by the syndicate. This party will be landed at or near to Cape Adare and be left there for one year, when the ship will return for them. We are informed that specialists in the various departments of investigation are to accompany the expedition, the total number of members comprising it being about twelve. The following is a general plan of the proposed investigations:—1. A land party will work towards the south magnetic pole, there to make magnetical observations. 2. The coast-line of the open bay will be surveyed, fjords and bays explored and sounded. 3. Zoological, botanical, mineralogical, and geological collections will be made. 4. Dredging. 5. Meteorological and pendulum observations. 6. Air and water current observations. Magnetic observations in the south are at present not only urgently required for the purposes of navigation, but also for supplying a missing link in our knowledge of terrestrial magnetism. There will be one vessel, a whaler, of about 300 tons, and a small steamer of 70 tons. The party will leave England on September 1 next.

Mr. Andrée's Balloon Voyage to the North Pole.—At the instance of the Swedish Ministry for Foreign Affairs, notice has been sent to the governments of Russia, Denmark, Great Britain, and the United States, of Herr Andrée's projected balloon voyage to the North Pole, and co-operation asked for on behalf of the expedition. Furthermore, the authorities in the countries surrounding the Polar circle will be asked to distribute some thousands of leaflets, containing illustrations of the balloon, and asking for information as to the time at which the balloon is seen and the direction of the wind at the moment. The Society is co-operating with the Minister of Sweden and Norway in London so far as stations in the Dominion of Canada are concerned.

Crossing of Novaya Zemlya.—In *Petermanns Mitteilungen*, 1895, No. XI. an account is given of a recent expedition to Novaya Zemlya, under Dr. Chernyshev. The expedition left Archangel on July 22 (N.S.), and reached that port again at the end of September. Its principal results were the geological examination of the coast between the west entrance to Matochkin Shar and Nameless Bay (see the maps in *Proc.*, 1880, p. 80), and the crossing of the south island from Karmakuly, on the west coast, to the Kara Sea (August 20 to 27), in the course of which astronomical as well as geological observations were made. Dog-sledges were used for the transport of the baggage.

GENERAL.

The "Challenger" Medal.—To commemorate the completion of the publication of the *Challenger Reports*, Dr. John Murray has presented a medal to the naval and civilian officers of the *Challenger* expedition, the contributors of memoirs to the *Reports*, and to a few other persons who either took part in the promotion of the expedition, or in the work connected with the publication of results. The accompanying illustration, from a photograph by Mr. John Thomson, shows both sides of the medal in the actual size. The work was designed by Mr. W. S. Black, of Edinburgh, an artist who took part in the illustration of the *Challenger Reports*; it was modelled by Mr. Birnie Rhind, of Edinburgh, and cast in bronze at Paris. The design is symbolical of the scope and work of the expedition. The obverse bears the head of Athene and her owl, with the terrestrial globe as a background, which, on the account of the high relief of the figures, looks somewhat flat. Neptune, with a trident in his left hand and a dredge in his right, occupies the right of the field, which is filled by a dolphin and two mermaids, with a scroll inscribed "Voyage of H.M.S. Challenger, 1872–76." The reverse shows the crest of the *Challenger*—a knight in armour throwing down his gauntlet to the sea—and is surrounded by a scroll with the words

"Report on the scientific results of the Challenger Expedition, 1876–95." The memento will be much prized by those who took part in the organization and work of the expedition and reports, and by their representatives to whom the medals



THE "CHALLENGER" MEDAL.

of those who have died before the completion of the work have been given. We are able to give below a complete list of those to whom the souvenir has been presented, the names being given in alphabetical order and exactly as they are engraved on the edge of the medal :—W. J. Abbott, Alexander Agassiz, Pelham

Aldrich, A. J. Allan, G. J. Allman, W. S. Anderson, A. F. Balfour, F. E. Beddard, Rudolph Bergh, G. R. Bethell, W. S. Black, G. S. Brady, A. C. B. Bromley, George Brook, W. K. Brooks, Alexander Buchan, J. Y. Buchanan, George Busk, G. G. Campbell, Alfred Carpenter, P. H. Carpenter, Arthur Channer, James Chumley, Thomas Comber, E. W. Creak, D. J. Cunningham, Arthur Dendy, H. N. Dickson, W. Dittmar, W. T. Thiselton Dyer, A. Milne-Edwards, Otto Finsch, Leopold Marquis de Folin, Michael Foster, T. W. Fulton, John Gibson, G. J. Goschen, L. von Graff, Albert Günther, A. C. Haddon, Ernst Haeckel, S. F. Harmer, Arthur Havergal, W. B. Hemsley, J. R. Henderson, W. A. Herdman, Richard Hertwig, Robert Higham, P. P. C. Hoek, R. E. Horsley, W. A. Howlett, W. E. Hoyle, A. A. W. Hubrecht, T. H. Huxley, John Hynes, Robert Irvine, A. von Kölliker, E. Ray Lankester, R. von Lendenfeld, O. von Linstow, Theodore Lyman, W. C. M'Intosh, George Maclean, J. L. P. Maclear, H. R. Mill, James Monteith, H. N. Moseley, Isabel Murray, G. S. Nares, F. G. Pearcey, Paul Pelseneer, T. Digby Pigott, N. N. Poléjaeff, Laurence Pullar, J. J. Quelch, A. F. Renard, G. H. Richards, R. R. A. Richards, S. O. Ridley, Tommaso Salvadori, Osbert Salvin, G. O. Sars, Howard Saunders, F. E. Schulze, Annie Sclater, P. L. Sclater, A. R. Scott, Emil Selenka, W. P. Sladen, E. A. Smith, W. J. Sollas, W. J. J. Spry, T. R. R. Stebbing, Th. Studer, R. von Willemoes-Suhm, Herbert Swire, P. G. Tait, Hjalmar Théel, C. Wyville Thomson, Frank Tourle Thomson, J. A. Thomson, T. H. Tizard, Alexander Turbyne, William Turner, A. W. Waters, Morrison Watson, R. B. Watson, Amelia Weir, J. J. Wild, E. P. Wright, Richard Wyatt.

Geography in Secondary Schools.—Although the position of geography in primary schools is now fairly satisfactory, it is to be feared that in secondary schools but little progress has been made since the publication of the Society's Report in 1885. Few of the teachers believe that the subject has any educational value, and even when convinced of its capabilities as an instrument of mental training, head masters are deterred by the exigencies of examinations from giving it a prominent place in the school curriculum. To some extent the remedy is in the hands of the public examining bodies, and for that reason the Geographical Association lately drew up four suggestions, which they sent in the form of questions to about three hundred secondary schools. Their report on the ninety-two answers received, which include expressions of opinion from nearly all the great public schools, may be briefly summarized as follows, the substance of the original suggestions being printed in italics: (1) *Papers in Geography should be set and looked over by geographical experts*, who have also had experience in teaching and examining boys. (2) *The Principles of Physical Geography should form part of every examination in Geography.* (3) *The subject of Geography is too wide and vague, and needs to be limited and defined for the purposes of examinations.* A general knowledge of the Earth should be required in all cases, together with a special study of some region, such as a continent, India, or the British Colonies. To indicate the general line of teaching to be followed, and the order in which the special subjects will be taken, a syllabus might be issued from time to time by the boards of examiners jointly; or a text-book might be published by authority for the guidance of teachers and examiners alike. (4) *Geography should either be made compulsory or receive enough marks to make it "pay."* To this it is objected that the pressure of compulsory subjects is already so great that any addition to their number would be intolerable. But the modified form of compulsion implied in the latter alternative is regarded as less objectionable than compulsion pure and simple. Many valuable suggestions have also been received, which the Geographical Association propose carefully to consider before moving any further in the matter. The report (of which the above is a brief summary) may be had on application to the hon. sec., Mr. B. B. Dickinson, Bloxam House, Rugby.

Death of Lieutenant Astrup.—We greatly regret to announce the death of Lieutenant Eivind Astrup, who took an important part in Lieutenant Peary's expedition to North Greenland. He was found lying dead on January 21 in the Lille Elvedal, but what was the cause of his death is not known. Besides taking part in the general work of Lieutenant Peary's expedition, Astrup explored Melville Bay on his own account, and gave a narrative of his expedition in the *Geographical Journal*, vol. v. p. 345. For this work the Council awarded him the Murchison grant in 1895.

Death of Herr Hugo Hölzel.—We record with regret the death of Herr Hugo Hölzel, head of the geographical publishing firm of Edw. Holzel in Vienna, which took place on December 15 last. Hugo Hölzel was born at Olmutz, in Moravia, on February 12, 1852, and in 1878 became head of the business founded by his father fifty years ago. In his hands the reputation of the house for the production of excellent maps and other geographical works was maintained and extended; geographers owe him no small debt of gratitude.

OBITUARY.

Major-General Henry Campbell Johnstone, C.B.

By General J. T. Walker, C.B., F.R.S.

Major-General Johnstone was a well-known officer of the Indian Survey Department. He belonged to the Revenue branch, the duties of which, in his time, consisted in making an exact survey of the boundaries of all British villages on the scale of 4 inches to the mile, and filling in the interior details by plane-tabling, for immediate topographical purposes, and also as a check on the subsequent operations of the Revenue and Settlement officers, whose measurements of areas by rough and primitive methods were required to agree, within a certain percentage, with the more exact measures of the Survey officers.

Such operations lie ordinarily within wholly British territories, and afford no opportunities for geographical exploration. But in 1855 Johnstone was deputed by Lord Laurence into the newly annexed regions west of the Indus, where he had frequently to extend his operations beyond the limits of the newly acquired British villages into the territories of the contiguous wild hill tribes. On this duty he was employed for twenty years. Beginning on the borders of the province of Sind, he worked northwards along the flank of the great Takht-i-Sulimani range to Bannu, and across the Kohat district to the Peshawar valley; he then crossed the Indus, and finished in the beautiful mountain district of Hazara, with its snow-clad peaks rising up to 18,000 and 19,000 feet in height. Here he fixed stations on peaks that had hitherto been pronounced impracticable, and he made an important discovery respecting the true course of the Indus between Astor and the Black mountain.

He always got on well with the wild tribes, and told a good story of an Affridi, who chanced to see his crest, the "flying spur." The man asked what it meant, and was told that in former days men in Scotland were as lawless as the Affridis, and that when the larder was empty, a dish was put before the chief containing only a spur with a pair of feathers attached to it, being a signal to him and his followers to boot and spur, and to raid the cattle over the border, and then the "flying spur" became the badge worn by the clan. The hearts of the frontier Affridis warmed to Johnstone when they found he was a descendant of the British Affridi.

From his professional occupation on the frontier, he was necessarily called on to join the military expeditions which had to be sent to chastise the wild tribe beyond. He thus made important maps of the Bozdai valley in 1857, the Kurram

valley in 1858, the Kabul Khel Waziris in 1859, the Mahsud Waziris in 1860, the Dawur valley in 1861, and the Ambeyla campaign in 1862. He had many adventures and hairbreadth escapes, and was honoured with the Companionship of the Bath and three medals for his military services.

He died on December 30, 1895, aged seventy-two.

CORRESPONDENCE.

The Island of Niuafóu.

HAVING, in September 1886, landed on this volcanic island a few days after the great eruption of that year, I think it may be interesting to compare the appearance of the place at that time with its present condition as described by Lieut. Somerville, R.N., in the last number of this *Journal*.

The eruption burst forth, after a series of earthquakes, from near the north-east side of the lake, which is itself the crater of the original volcano which probably formed the island. Lieut. Somerville's drawing shows the site of the eruption as a peninsula jutting into the lake, with a couple of craters on it. The peninsula, as I saw it in 1886, consisted mainly of a rounded hill some 200 feet high of brown earth, with three seething mouths near its base, towards the land. The contents of one of these was covered with a bright green (? sulphurous) scum; another, of rectangular shape, and deep, was filled with mud and water. These are probably the two mentioned by Lieut. Somerville, and there were one or two others. The shores of the lake beyond were heaped with what might have been pumice, but looked to me more like black sand. The matter ejected from the main vent consisted of volumes of steam enveloping red-hot stones, which rose to an immense height, but fortunately fell straight back again, and which, as they fell, threw off masses of dust which had the effect of fiery tails. This dust, sometimes a brown earth, otherwise a nearly black sand, was carried everywhere by the winds, and two-thirds of the island were buried beneath it, in many places to a depth of several feet. The amount ejected, therefore, was enormous, without reckoning the amount represented by the hill above mentioned of 200 feet, rising out of a very deep lake. The lake was still bubbling, and constant slight tremors and movements of the soil of the island were going on, and gases escaping from it. Vegetation was everywhere crushed by the weight of the sand, which was damp from the steam—the coconuts looking deplorable, with their branches hanging down broken by their sides, the central shoot alone remaining erect. The yam gardens, too, which had just been planted, were overwhelmed, and the people were trying to remove some of the superincumbent weight so as to allow the plants to push through. But even the coco-palms (which bear the biggest fruit of any in the Pacific) probably recovered eventually, though they could not bear for a time, and the dust and sand have long, to judge from Lieut. Somerville's description, disappeared beneath the luxuriant vegetation; though two great lava streams, of nearly fifty and thirty years age respectively, which jut out into the sea like great embankments or breakwaters, are still scantily covered—the latter, indeed, hardly clothed at all.

The dark sand was pronounced by Prof. Bonney to be a basalt glass (tachylyte), with a silica percentage of probably over 50, with specific gravity about 2·73, resembling the glassy lavas of the Sandwich islands.

It is worth noting that the principal earthquakes which preceded the eruption, as early as June 8 and 12, coincided with the first outbreak at Rotomahana, in New Zealand (June 12); while the great eruption, on August 31, was within a few hours of the severe earthquake at Charleston, U.S.A.

It may possibly be inferred, from the name Niuafóu (*i.e.* New Niua, the old being probably Niua-tobutabu, or Keppel island), that the existence of the island is historically recent. It is said, I think, to have been seen by Tasman.

COUTTS TROTTER.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1895–96.

Fourth Ordinary Meeting, January 6, 1896.—SIR GEORGE GOLDIE, K.C.M.G., Vice-President, in the Chair.

ELECTIONS.—*Rev. John Bufton; Rev. John Meldrum Dryerre, LL.B.; Francis Arthur Farrell; Frederick Craufurd Goodenough; A. C. Hall, B.A.; Evan Hare; Evan Herring Hare, M.A.; I. D. Inverarity; John Alfred Jones; Reginald F. Knollys; Herman Le Roy-Lewis, J.P.; Sir George Glynn Petre, K.C.M.G., C.B.; J. S. Rutherford.*

The Paper read was:—

"A Journey through Somaliland, to Lakes Rudolf and Stefanie, and thence to Lamu by the Tana river." By Dr. Donaldson Smith.

DEATH OF MR. H. SEEBOHM.

The Chairman made the following remarks: Your President, Mr. Clements Markham, has been very ill, and is unable to attend to-night. He has requested me to state that at the time of your last meeting he was already unwell, owing to which he omitted to perform the melancholy duty, which now devolves upon me, of referring to the loss the Society has sustained in the death of one of our Honorary Secretaries, Mr. Henry Seebohm. I ought, however, to say that the funeral of our esteemed and valued colleague was attended both by the President and by our other Honorary Secretary, Major Darwin. I must not dwell at present on the services to geography rendered by Mr. Henry Seebohm, but I may just remind you that there is an excellent obituary notice in the *Journal* of the Geographical Society for January.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., *Librarian*, R.G.S.

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce, Commercial.
C. R. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
J. = Journal.
M. = Mitteilungen.
Mag. = Magazine.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue, Revista.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

EUROPE.

Greece. *Petermanns M.* 41 (1895): 273–279. **Philippson.**
Zur Vegetationskarte des Peloponnes. Von Dr. Alfred Philippson. *With Map.*

Austria—Bosnia-Herzegovina. **Munro.**

Rambles and Studies in Bosnia-Herzegovina and Dalmatia, with an account of the Proceedings of the Congress of Archæologists and Anthropologists held in Sarajevo, August, 1894. By Robert Munro. Edinburgh and London: W. Blackwood and Sons, 1895. Size 9 × 6, pp. xx. and 396. *Illustrations. Price* 12*s.* 6*d. Presented by the Publishers.*

Dr. Munro's book is at once an interesting narrative of a visit to Bosnia-Herzegovina and a connected account of the archæological discoveries made in those provinces, winding up with a summary of what is known of the region during prehistorical and historical times.

The Riviera. **Lenthéric.**

The Riviera, Ancient and Modern. By Charles Lenthéric. Translated by Charles West, M.D. London: T. Fisher Unwin, 1895. Size 8½ × 6, pp. xviii. and 464. *Maps. Price* 7*s.* 6*d. Presented by the Publisher.*

Dr. West has translated M. Lenthéric's well-known work on the Riviera, the value of which he had himself experienced, "not as a Guide-Book, but as a Companion to the intelligent traveller." The translation is fluent, and the book should meet an appreciative public.

ASIA.

Afghanistan. **Gray.**

At the Court of the Amîr. A Narrative. By John Alfred Gray, M.B. London: R. Bentley and Son, 1895. Size 9 × 6, pp. xviii. and 524. *Portraits, etc. Price* 16*s. Presented by the Publishers.*

Dr. Gray here gives a detailed account of his impressions of Afghanistan, with many interesting descriptions of places and personages.

Dutch East Indies. **Van der Chijs.**

Nederlandsch-Indisch Plakaatboek, 1602–1811, door Mr. J. A. Van der Chijs. Dertiende Deel, 1800–1803. Batavia: Landsdrukkerij, 1895. Size 8½ × 5½, pp. 784. *Presented by the Batavian Society of Arts and Sciences.*

India—Chitral. **Younghusband.**

The Relief of Chitral. By Captain G. J. Younghusband and Captain Frank E. Younghusband. London: Macmillan & Co., 1895. Size 9½ × 6, pp. viii. and 184. *Map and Illustrations. Price* 8*s.* 6*d.*

A spirited account of the Chitral expedition by the *Times* special correspondents, provided with excellent illustrations.

India—Kusī River. *J. Asiatic S. Bengal* **64** (Pt. 1) (1895): 1–24. **Shillingford.**

On changes in the course of the Kusī River, and the probable dangers arising from them. By F. A. Shillingford. *With Map.*

Indo-China. *B.S.G. Paris* (7 S.) **16** (1895): 389–404. **Henri d'Orléans.**

Du Tonkin au Yunnan. Par le Prince Henri d'Orléans. *With Sketch-map.*

Malay Archipelago—Celebes. *Z. Ges. Erdk. Berlin* **30** (1895): 311–352. **Sarasin.**

Reiseberichte aus Celebes. Von Paul und Fritz Sarasin. Dritter Bericht. IV. Reise durch Central-Celebes vom Golf von Boni nach dem Golf von Tomini. *With Map.*

This is noticed in the Monthly Record.

Malay Archipelago—Java. **Groneman.**

De Garĕbĕg's te Ngajogyakarta. Door J. Groneman. Met photogrammen van Cephas. Uitgegeven door het Koninklijk Instituut voor de Taal-, Land- en Volken-Kunde van Nederlandsch-Indië. 's-Gravenhage: M. Nijhoff, 1895. Size 10 × 12½, pp. 88.

Malay Archipelago—Sumatra. ———

Phœnician Characters from Sumatra in the Pitt-Rivers Museum. [From Archæologia Oxoniensis. Part. VI., pp. 7.] Oxford: London: H. Frowde, 1895. Size 9½ × 6½. *Plate. Presented by the Publisher.*

This paper will be referred to in the Monthly Record.

Malay Archipelago—Sumatra. **Muller.**

De verplaatsing van eenige Triangulatie-Pilaren in de Residentie Tapanoeli (Sumatra) tengevolge van de aardbeving van 17 Mei 1892. Door J. J. A. Muller. Verhandelingen der Koninklijke Akademie van Wetenschappen te Amsterdam. (Eerste Sectie.) Deel III. No. 2. Amsterdam: J. Müller, 1895. Size 10½ × 7½, pp. 26. *Map and Plates.*

Manchuria and Eastern Siberia. **Launay.**

Missions Catholiques **27** (1895): 186, 200, 208, 228, 261, 269, 281, 297, 307, 317, 331, 343, 353, 368, 377, 389.

Mandchourie et Sibérie Orientale. Par M. Adrien Launay. *With Map and Illustrations.*

Philippine Islands—Typhoons. **Algué.**
Observatorio de Manila. Baquios ó Tifones de 1894. Estudio de los mismos, seguido de algunas consideraciones generales acerca de los caracteres de estos meteoros en el extremo Oriente. Por el P. José Algué S. J. Manila, 1895. Size 12½ × 9, pp. 182. *Diagrams. Presented by the Manila Observatory.*

Russian Armenia—Ani. *Globus* **68** (1895): 263–267. **Krahmer.**
Die altarmenische Hauptstadt Ani. Von Krahmer. Generalmajor z. D. Originalaufnahmen von Orden in St. Petersburg. *With Illustrations.*

Siam. **Grindrod.**
Siam: a geographical summary. By Mrs. Grindrod. London: E. Stanford, 1895. Size 9 × 6, pp. 142. *Map. Price* 5*s. Presented by the Publisher.*

This book has been compiled for the special use of Siamese boys being educated in this country. The plan is a good one, the four main sections being Physiographical, Anthropological, Historical and Political, Commercial and Industrial. Mr. McCarthy's map of Siam, published in the *Journal*, is reproduced with some slight alterations, and the addition of an index to all the names contained in it.

Siberia—Amur Province. *G.Z.* 1 (1895): 580–603. **Immanuel.**
Die Amurprovinz. Beitrag zur Kenntnis der Entwickelungsfahigkeit Ostsibiriens. Von Hauptmann Immanuel in Wittenberg.

Siberia—Transbaikalia. *Petermanns M.* **41** (1895): 217–220. **Krahmer.**
Transbaikalien. Von Generalmajor z. D. Krahmer.

Syria—The Hauran. **Ewing.**
Palestine Exploration Fund, Q. Statement (1895): 60–67, 161–184, 281–294, 355–368.
A Journey in the Hauran. By Rev. W. Ewing. *With Sketch-map.*

Transcaspian Region. *Imp. Asiatic Quarterly Rev.* (2) **10** (1895): 148–155. **Tarnovski.**
Transcaspia and Khurasan. By Capt. Geo. V. Tarnovski.

Transcaucasia—Tiflis Observations. ———
Beobachtungen der Temperatur des Erdbodens im Tiflisser Physikalischen Observatorium in den Jahren 1888 und 1889. Tiflis, 1895. Size 9½ × 7, pp. xx. and 404.

AFRICA.

Algeria and Tunis. **Playfair.**
Handbook for Travellers in Algeria and Tunis. Algiers, Oran, Tlemçen, Bougie, Constantine, Tebessa, Biskra, Tunis, Carthage, Bizerta, etc. By Sir R. Lambert Playfair, K.C.M.G. Fifth edition. London: John Murray, 1895. Size 7 × 5, pp. xiv. and 364. *Maps and Plans. Price* 10*s.* 6*d. Presented by the Publisher.*

The new maps and thorough revision of this handbook, combined with its clear type and thin paper, make the volume fuller, more compact, and easier of reference than ever.

Congo—Bibliography. **Wauters.**
Bibliographie du Congo, 1880–1895. Catalogue méthodique de 3800 ouvrages, brochures, notices et cartes relatifs à l'histoire, à la géographie et à la colonisation du Congo. Par A.-J. Wauters avec la collaboration de M. Ad. Buyl. Brussels: Administration du Mouvement Géographique, 1895. Size 9 × 6, pp. l. and 356. *Presented by the Author.*

This will be noticed along with other books on Africa in a special review.

Congo Free State. *Mouvement G.* **12** (1895): 293–295. ———
Les districts de l'État. *With Map.*

Congo State—Lake Moëro. **Descamps.**
Mouvement Antiesclavagiste Belge **7** (1895): 257–961.
Au lac Moëro. Par le commandant Descamps.

East Africa—Transport. *Deutsche Kolonialzeitung* **8** (1895): 363–365. **Pfeil.**
Der Ochsenwagen in Ostafrika. Von Joachim Graf Pfeil.

Egypt. **Sayce.**
The Egypt of the Hebrews and Herodotus. By the Rev. A. H. Sayce London: Rivington, Percival & Co., 1895. Size 8 × 5½, pp. xvi. and 342. *Price* 7*s.* 6*d. Presented by the Publishers.*

Special notice will be taken of this work, the object of which is to supplement the usual sources of information available for tourists and students.

Egypt—Antiquities. **Schweinfurth.**
Ein altes Heiligtum an den Ufern des Möris. Von Georg Schweinfurth. [From *Illustrierte Deutsche Monatshefte.*] 1895. Size 11 × 7½, pp. [12]. *Illustrations. Presented by the Author.*

Egypt—Nile Reservoirs. *Scottish G.M.* **11** (1895): 393–402. **Pearsall.**
The Nile Reservoirs. By H. D. Pearsall.

Egypt—Nile Valley. **Lugard.**
England and France in the Nile Valley. By Captain F. D. Lugard. From the *National Review*, July, 1895, pp. [14]. *Map.* Size 10 × 6½.

Egyptian Sudan. *B.S. Khédiviale G.* **4** *S.* (1895): 331–351. **Slatin.**
Conférence faite à la Société Khédiviale de Géographie. Par S. E. Slatin Pacha. *With Portrait.*

Equatorial and South Africa. **Peters.**
Aequatorial- und Süd-Afrika nach einer Darstellung von 1719. Der Kongo und der 'Grosse Wald' 160 Jahre vor ihrer Entdeckung durch Stanley. Ophir und die Portugiesischen Goldminen am Sambesi. Von Dr. Carl Peters. Berlin: D. Reimer, 1895. Size 11 × 7½, pp. 16. *Map.*

Eritrea—Climate. *B.S.G. Italiana* (3) **8** (1895): 240–248. **De Magistris.**
Sul clima della Colonia Eritrea. Di L. F. De Magistris.

Eritrea and Somali Land. *Rev. Maritime et Colon* **127** (1895): 225–256. **Brion.**
Les Colonies italiennes, par M. E. Brion.
A general account of the Italian sphere of influence in East Africa.

French West Africa. **Clozel.**
Tour du Monde (*A travers le Monde*): 1 (N.S., 1895): 333–336.
M. Clozel au Congo. Une Nouvelle Voie de Pénétration vers le Tchad. *With Illustrations.*

French West Africa. *Missions Catholiques* **27** (1895): 357–358, 364–367. **Hacquart.**
De Marseille à Ségou-Sikoro (Journal de route de la mission du Soudan). Par le R. P. Hacquart. *With Illustrations.*

French West Africa. *B.S.G. Paris* (7 S.) **16** (1895): 330–373. **Mizon.**
Résultats scientifiques des voyages de M. Mizon, lieutenant de vaisseau (1890–1893).
Itinéraire de la source de la Bénoué au confluent des rivières Kadeï et Mambéré et Essai d'une carte des régions voisines de l'itinéraire. Par L. Mizon. *With Maps.*

French West Africa—Timbuktu. *B.S.G. Paris* (7 S.) **16** (1895): 374–388. **Bluzet.**
La région de Tombouctou. Par R. Bluzet. *With Map.*

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French Progress in the Western Soudan, 1894–95. By Captain S. Pasfield Oliver. *With Maps.*

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Ueber die Uluguruberge in Deutsch-Ostafrika. Von Dr. Stuhlmann.

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New Rubber Industry in Lagos. *With Plate.*

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La puissance maritime de l'Angleterre et l'importance de Madagascar. Par M. Nogues. *With Map.*
Madagascar: les forêts, le caoutchouc—Chronique de l'expédition. Par Gabriel Vasco. *With Map and Profiles.*

Madagascar—Languages. *J. Anthrop. I.* **25** (1895): 46–71. **Last.**
Notes on the Languages spoken in Madagascar. By J. T. Last.

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Portuguese West Africa. *B.S.G. Lisboa* **14** (1895): 5–67. **Paiva.**
Expedição ao Bihé. Estudos do plan' alto. Relatorio official do Major Arthur de Paiva.

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La colonie portugaise d'Angola. Les derniers traités qui lui ont donné sa configuration territoriale actuelle. Par Dr. Rouire.

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Notes on the Fisheries and other Industries capable of being profitably undertaken in the Island of St. Helena. Compiled for the St. Helena Industries, Limited. [London: W. J. Richardson (1895).] Size 9½ × 6, pp. 8. *Presented by R. A Sterndale, Esq.*

The St. Helena Industries is a company which has been formed with the object of restoring to St. Helena some part of the prosperity it formerly enjoyed. The resources and potentialities of the island are clearly summarized in this pamphlet.

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L'Afrique australe et la colonization néerlandaise. Par M. le Dr. Ivens.

A history of the part played by the Dutch in South Africa.

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South Africa. A study in Colonial Administration and Development. By W. Basil Worsfold. London: Methuen & Co., 1895. Size 8 × 5½, pp. xii. and 266. *Map. Price 6s. Presented by the Publisher.*

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Bizerte et son nouveau port. La région de Bizerte. La presqu'île de Porto-Farina. Les Mogods. Le territoire de Mateur. Par M. le capitaine Ch. Maumené. *With Map and Illustrations.*

A description of the new port of Bizerta, by the same author, is also given in *B.S.G. Com., Havre* (1895): 152–172.

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Ashanti and the Gold Coast. By W. Scott Dalgleish. *With Map.*

The map shows the forests and open pasture land.

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Ueber den Stand der geographischen Forschung in Nord-Amerika (einschliesslich Mittelamerikas und West-Indiens). Von Dr. Emil Deckert.

America. **Deckert, Kükenthal, and Sievers.**
Amerika. Eine allgemeine Landeskunde. In Gemeinschaft mit Dr. E. Deckert und Prof. Dr. W. Kükenthal herausgegeben von Prof. Dr. Wilhelm Sievers. Leipzig und Wien: Bibliographisches Institut, 1894. Size 10½ × 7½, pp. xii. and 688 *Maps and Illustrations (some coloured). Price 13s. 6d.*

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Notes on Vancouver Island. By Alexander Begg.

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No. 108—Part III., Supplement. [U.S.] Hydrographic Office. Sailing Directions for North Channel of Lake Huron and Georgian Bay. Washington, 1895. Size 9½ × 6, pp. 314. *Presented by the U.S. Hydrographic Office.*

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Ueber das Colorado-Plateau zum Grand Cañon. Ein Vortrag von Prof. Dr. Hermann Credner in Leipzig.

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P.A. Nat. Sci. Philadelphia (1895): 198–205.

Does the Delaware Water Gap consist of Two River Gorges? By Emma Walter. *With Map.*

United States—Indian Territory. *B. American G.S.* **27** (1895): 272–276. **Gannett.**

Indian Territory. By Henry Gannett.

Describes the present state of Indian territory, and anticipates approaching political changes on account of the rapid increase of white population.

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Tertiary Revolution in the Topography of the Pacific Coast. By J. S. Diller.—Fourteenth Annual Report of the United States Geological Survey, . . . 1892–93. By J. W. Powell, Director. Part II. Washington: Government Printing Office, 1894. Size 12 × 8, pp. 397–434. *Maps and Plates. Presented by the U.S. Geological Survey.*

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Our Pennsylvanian Forests. By Dr. J. F. Rothrock.

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Johns Hopkins University Studies in Historical and Political Science. Thirteenth Series. VI., VII. White Servitude in the Colony of Virginia. By James Curtis Ballagh. Baltimore: The Johns Hopkins Press. 1895. Size 9½ × 6½, pp. 100.

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Die Zahl der Weissen im tropischen Amerika. Von A. Oppel in Bremen.
An estimate of the proportion of Europeans in the states of Central and South America.

Argentine and Chile Boundaries. **Arana.**
La Cuestion de Limites entre Chile i la República Arjentina. Por Diego Barros Arana. Santiago de Chile: Imprenta Cervantes, 1895. Size 10 × 7, pp. 58. *Presented by the Author.*

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Chile und Argentinien in der patagonischen Kordillere. Von Dr. Hans Steffen.

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Showing how geographical principles might have been applied to the determination of boundary-lines in the Guiana Plateau.

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Informe sobre la Exploracion de Talamanca verificada durante los Años de 1873-74. Por William M. Gabb.

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Naturstudien über das östliche Peru im Quellgebiet des Amazonenstromes. Von Richard Payer.

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The Coast Desert of Peru. By Major Alfred F. Sears

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Deutsche Kolonisation in Südamerika. Vortrag des Herrn Direktors des Norddeutschen Lloyd Dr. Wiegand in der Sitzung des XI. Deutschen Geographentages am 19 April 1895

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G. Tidskrift **12** (1893): 63-79, (1894): 131-144; **13** (1895): 60-85.
Momenter af Vestindiens Geografi. Ved Cand. Holger Lassen.

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Die Zustände auf der Oster-Insel. Von Dr. H. Polakowsky.

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Beiträge zur Kenntnis der Deutschen Schutzgebiete. Von Paul Langhans. *With Maps.*

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Der Bezirk von Hatzfeldthafen und seine Bewohner. Von F. Grabowsky. *With Map.*

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Notes pittoresques sur les îles Loyalty. Par M. Bénet. Congrès National des Sociétés Françaises de Géographie. XV^e^ Session. Lyon, 1894. Compte rendu des travaux du Congrès. Lyon: E. Vitte, 1895. Size 10 × 6½, pp. 378–388.

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Bericht über die Gesundheitsverhältnisse der Eingeborenen der Marshall-Inseln im Jahre 1893–94; und Bemerkung über Fischgift. Von Dr. med. Steinbach.
Bericht von Regierungsarzt Dr. Schwabe über die Gesundheitsverhältnisse der Marshall-Inseln.

Melanesia—Bismarck Archipelago. **Ray.**
Texts in the Languages of the Bismarck Archipelago (Neu-Lauenburg and Neu-Pommern). Edited, with literal Translations and Notes, by Sidney H. Ray. Separat-Abdruck aus "Zeitschrift für afrikanische und oceanische Sprachen, 1. Jahrgang, 4 Heft." [Berlin, n. d.] Size 11 × 7½, pp. 30. *Presented by Sidney H. Ray, Esq.*

New Guinea—Purari River. **Bevan.**
The Discovery of the Great "Purari" (Queen's Jubilee River), New Guinea. By Theodore Bevan. Size 11 × 8½, 1 leaf. *Presented by the Author.*

A vindication of Mr. Bevan's claim to the discovery of the Purari river, which he forwards to the Society in order that it may be pasted as an appendix in his book entitled 'Toil, Travel, and Discovery in British New Guinea.'

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Floatsam and Jetsam from the Great Ocean; or, Summary of Early Samoan Voyages and Settlement. With supplementary notes and comments. By the Rev. John B. Stair.

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Zur alpinen Kartographie. Von L. Obermair.
A bibliography of recent alpine maps.

Area and Volume of Continents, etc. **Wagner.**
Areal und mittlere Erhebung der Landflächen, sowie der Erdkruste. Eine kritische Studie, insbesondere über den Anwendungsbereich der Simpson'schen Formel. Von Hermann Wagner. Beiträge zur Geophysik . . . [illegible] Prof. Dr. Georg Gerland. II. Band, 2–4. Heft, pp. [illegible] E. Schweizerbart, 1895. Size 9½ × 6. *Plate.* [illegible]
A special note on this article will appear in the *Journal.*

Atmospheric Refraction. *P.R. Artillery J.* **22** (1895): 269–288. **MacMahon.**
Terrestrial Refraction and Mirage. By Major P. A. MacMahon. *With Illustrations.*

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Bemerkung über das "Areal eines Landes" und über eine Verbesserung am Planimeter. Von Prof. E. Hammer.

Cartographical Tables. *M. k.k. Militär G. I.* **14** (1894–95). 53–130. **Hartl.**
Tafeln, enthaltend die Ausmasse der Meridian- und Parallelkreis-Bögen, dann die Logarithmen der Krümmungs-Radien des Besselschen Erdellipsoides, berechnet, unter der Leitung von Oberstlieutenant H. Hartl.

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Veröffentlichung des Königl. Preussischen Geodätischen Institutes. Zenitdistanzen zur Bestimmung der Höhenlage der Nordsee-Inseln Helgoland, Neuwerk und Wangeroog, sowie des Leuchtturmes auf Roter

Sand über den Festlandspunkten Cuxhaven und Schillig. Berlin: P. Stankiewicz, 1895. Size 11½ × 9, pp. xiv. (52), and 280. *Map and Plates. Presented by the Institute.*

Geodesy. *Atti R. A. Lincei* (5) *Rendiconti* **4** (1895): 420–425. **Reina.**
L'attrazione locale nella Specola geodetica di S. Pietro in Vincoli in Roma. Nota di V. Reina.

Gravity determinations. *M. k.k. Militär, G. I.* **14**, 1894 (1895): 242–313. **Sterneck.**
Relative Schwerebestimmungen, ausgeführt im Jahre 1894, nebst einem Anhange über Barymeter-Beobachtungen, von Oberst Robert v. Sterneck.

Magnetic Intensity. **Fritsche.**
Ueber den Zusammenhang zwischen der Erdmagnetischen Horizontalintensität und der Inclination. Mit einem Anhange von 29 Tafeln. Von Dr. H. Fritsche. St. Petersburg, 1895. Size 9½ × 6, pp. 14 and 28. *Presented by the Author.*

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The Nautical Almanac and Astronomical Ephemeris for the year 1899, for the Meridian of the Royal Observatory at Greenwich. Published by order of the Lords Commissioners of the Admiralty. Also Part I. (containing such portions as are essential for navigation). London: Eyre and Spottiswoode [1895] Size 9½ × 6, pp. xiv., 636, and 20; (Part I.) xiv and 306. *Price* 2*s.* 6*d.*; *Part I.*, 1*s. Presented by the Admiralty.*

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Horizontalpendel-Beobachtungen auf der Kaiserlichen Universitäts-Sternwarte zu Strassburg, 1892–1894. Von Dr. E. von Rebeur-Paschwitz. Beiträge zur Geophysik . . . Herausgegeben von Prof. Dr. Georg Gerland. II. Band, 2–4 Heft, pp. 211–536. Stuttgart: E. Schweizerbart, 1895. Size 9½ × 6. *Plates. Presented by the Publisher.*

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Nouvelles manifestations mécaniques de la rotation de la Terre. Par M. J. Andrade.

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Sur une amplification mécanique de la composante horizontale de la rotation de la Terre. Note de M. Jules Andrade.
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Nouvel instrument (Tachéographe) servant au trace direct et au levé direct du terrain. Note de M. Schrader.

Terrestrial Magnetism. *American J. Sci.* (3) **50** (1895): 109–115. **Bauer.**
On the Distribution and the Secular Variation of Terrestrial Magnetism, No. 1. By L. A. Bauer.

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Sur la construction de nouvelles Cartes magnétiques du Globe, entreprises sous la direction du Bureau des Longitudes. Note de M. de Bernardières.
This is specially referred to in the Monthly Record.

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The Earth a Magnetic Shell. By Frank H. Bigelow.

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Loi de la distribution du magnétisme moyen à la surface du globe. Note de M. le général Alexis de Tillo.

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La recoloration des Alpes après le coucher du soleil. Par M. H. Dufour.

Cinchona—Cultivation. *B.S. Africaine, France*, (1895): 104–118. **Verrier.**
Étude des arbres à quinquina, conditions propres à leur culture, leur introduction dans nos Colonies Africaines, et en particulier à Madagascar. Par le Dr. E. Verrier. *With Plate.*

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Nouvelle théorie cosmogonique. Par M. A. Duponchel.

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Ueber submarine Erdbeben und Eruptionen. Zweiter Beitrag, von E. Rudolph.—Beiträge zur Geophysik . . . Herausgegeben von Prof. Dr. Georg Gerland. II. Band. 2.-4. Heft, pp. 537–666. Stuttgart: E. Schweizerbart, 1895. Size 9½ × 6. *Presented by the Publisher.*

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Vorschläge zur Errichtung eines internationalen Systems von Erdbeben-Stationen. (Von E. v. Rebeur-Paschwitz.)—Beiträge zur Geophysik . . . Herausgegeben von Prof. Dr. Georg Gerland. II. Band. 2.-4. Heft, pp. 773–782. Stuttgart: E. Schweizerbart, 1895. Size 9½ × 6. *Presented by the Publisher.*

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Les dépôts glaciaires et fluvio-glaciaires du bassin de la Durance. Note de MM. W. Kilian et A. Penck.
De la coexistence, dans le bassin de la Durance, de deux systèmes de plis conjugués, d'âge différent. Note de M. Émile Haug.

Glacier-study. *C.R.* **121** (1895): 300–302. **Forel.**
La Commission internationale des glaciers. Note de M. F. A. Forel.
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The influence of débris on the flow of glaciers. By Israel C. Russell.
A note on this paper will be given in the Monthly Record.

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Karstformen der Gletscher. Von Dr. Rob. Sieger in Wien.

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Bulletin No. 11—Part II. U.S. Department of Agriculture, Weather Bureau. Report of the International Meteorological Congress, held at Chicago, Ill., August 21–24, 1893, under the auspices of the Congress Auxiliary of the World's Columbian Exposition. Part II. Edited by Oliver L. Fassig, Secretary. Washington: Weather Bureau, 1895. Size 10 × 6½, pp. [378]. *Plates.*

Land Forms. *B. American G.S.* **27** (1895): 161–173. **Brigham.**
The Composite Origin of Topographic Forms. By Albert Perry Brigham.
A special note on this paper appeared in the *Journal* for December, 1895, vol. vi. p. 575.

Meteorology—Law of Storms. **Schwérer.**
Rev. Maritime et Coloniale **126** (1895): 489–525.
Étude sur la loi des tempêtes. Par A. Schwérer.

Meteorology—Winds. *Mém. S.R.G. Anvers* **4** (1895): 97–104. **Plumandon.**
Variations de la vitesse des vents avec l'altitude et avec la position géographique des lieux d'observation. Par J. R. Plumandon.

Morphology of Earth. *G.Z.* **1** (1895): 109–127, 204–225. **Philippson.**
Die neueren Forschungen und Ansichten über den Bau der Erdkruste. Von Alfred Philippson, in Bonn.

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Sur la deuxième campagne scientifique de la *Princesse-Alice*. Par Albert Ier, Prince de Monaco.
A summary of the work in sounding, dredging, and deep-sea fishing carried on between May 23 and August 16 last year in the waters of the North Atlantic. The Prince was present at the capture of a sperm whale, the food of which was found to contain several new species of gigantic cephalopods.

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Ueber die Entstehung der Ostsee. Ein Vortrag. Von Prof. Dr. Rudolf Credner in Greifswald. *With Map.*

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Les vents et les courants de la Mer. Par le Général H. Mathiesen. Extrait de la Revue maritime et coloniale (Juin 1895). Paris: L. Baudoin, 1895. Size 10 × 6½, pp. 16. *Presented by the Author.*

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Oceanography—Norwegian Researches. **Hjort.**
Norske G. S. Aarbog. **6** 1894–1895 (1895): 127–146.
Hydrografisk-biologiske studier over norske fiskerier. Af dr. J. Hjort. *With Maps.*

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Currents in the Red Sea. By Captain W. H. Hood.
The result of practical observations on several voyages.

Oceanography—Tide-Recorder. **Westphal.**
Untersuchungen über den selbstregistrirenden Universalpegel zu Swinemünde. System Seibt-Fuess. Von Prof. A. Westphal. Mittheilung aus dem Königl. Geodätischen Institut zu Potsdam. Sonderabdruck aus der Zeitschrift für Instrumentenkunde 1895. Heft 6. Berlin: J. Springer. Size 11 × 8, pp [12.]

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Grundzüge der physischen Erdkunde. Von Prof. Dr. Alexander Supan. Zweite . . . Auflage. Leipzig: Veit & Co., 1896 [1895]. Size 9½ × 6, pp x. and 706. *Maps and Illustrations. Presented by the Author.*
As a proof of the thoroughness with which this most valuable manual of physical geography has been revised for its second edition, we note the appearance on the bathy-hypsographical maps of the Earth of the deepest sounding found by H.M.S. *Penguin* last June.

Plants for Temperate Regions. **Mueller.**
Select Extra-Tropical Plants, readily eligible for Industrial Culture or Naturalization, with indications of their native countries and some of their uses. By Baron Ferd. von Mueller, Government-Botanist for Victoria. Ninth Edition. Melbourne, 1895. Size 8½ × 6, pp. xii. and 654. *Presented by the Author.*
This work, already well known and widely used throughout the world, is a striking proof of the wisdom of colonial governments in maintaining, as permanent scientific advisers, men of such energy and eminence as Baron Sir Ferdinand von Mueller.

Spelæology. **Martel.**
E. A. Martel. Sous Terre (Septième Campagne). 1894. Extrait de l'Annuaire du Club Alpin Français. 21^e^ volume, 1894 [pp. 172–193]. Paris: Typ. Chamerot & Renouard, 1895. Size 9 × 6, pp. 24. *Plates. Presented by the Author.*

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Geographie und Höhlenkunde. Von Regierungsrat F. Kraus in Wien.
An account of the position of Spelæology, the science of caverns, in geography.

ANTHROPO-GEOGRAPHY AND HISTORY.

Anthropology—Yellow Races. **Hamy.**
Dr. E.-T. Hamy. Considérations générales sur les Races Jaunes. Extrait de *l'Anthropologie.* T. VI, No. 3. Paris: G. Masson [1895]. Size 10 × 6¼, pp. 16 *Presented by the Author.*

Egyptian Beliefs. **Schweinfurth.**
Die Wiedergeburt Aegyptens im Lichte eines aufgeklärten Islam. Von Professor Dr. Georg Schweinfurth. Sonderabdruck aus Nr. 24 der "Berliner Rundschau" vom 10 Juli, 1895. Berlin: Thormann & Goetsch. Size 10 × 7, pp. 16. *Presented by the Author.*

Historical—Italian Maps. *Mem. S.G. Italiana* **5** (1895): 45–73. **Porena**
Un cartografo Italiano del principio del secolo XVIII. Memoria del Socio Prof. Filippo Porena.

Historical—Terra Australis. *Deutsche G. Blätter* **18** (1895): 147–171. **Ruge.**
Das unbekannte Südland. Von Professor Dr. S. Ruge.

Historical—Verrazano's Globe. *Rev. G.* **37** (1895): 175–177 **Harrisse.**
Un nouveau globe verrazanien. Par Henry Harrisse.

Linguistic—Bugi language. **Brandstetter.**
Malaio-Polynesische Forschungen. Von Dr. Renward Brandstetter. IV. Die Geschichte von König Indjilai. Eine bugische Erzählung ins Deutsche übersetzt. Zugleich ein Hilfsmittel für das Studium der bugischen Sprache. Luzern, 1895. Size $10\frac{1}{2} \times 8\frac{1}{2}$, pp. vi. and 28.

Place-Names. *Petermanns M.* **41** (1895): 257–259. **Staudinger.**
Ueber die Schreibweise von Ortsnamen in den deutschen Kolonien und das vorgeschriebene Alphabet. Von P. Staudinger.

Place-Names. **Barbier.**
Irrégularités orthographiques des noms de lieux. Par M. J. V. Barbier.—Congrès National des Sociétés Françaises de Géographie. XV^e^ Session. Lyon, 1894. Compte rendu des travaux du Congrès. Lyon: E. Vitte, 1895. Size 10 × $6\frac{1}{2}$, pp. 284–289.

BIOGRAPHY.

d'Albaigne. **Hamy.**
Franciscque et André d'Albaigne cosmographes lucquois au service de la France. Par M. le Dr. E.-T. Hamy. (Extrait du Bulletin de géographie historique et descriptive. 1894.) Paris: Imprimerie Nationale, 1895. Size 10 × $6\frac{1}{2}$, pp. 34. *Presented by the Author.*

Notes regarding the work of two Italian geographers of the sixteenth century.

Dana. *J. Geology* **3** (1895): 601–621. **Williams.**
James Dwight Dana and his work as a Geologist. By Henry Shaler Williams.

A biographical sketch, with portrait, is also given in the *Deutsche Rundschau G.* **17** (1895): 471–473.

Ehrenberg. *Deutsche Rundschau G.* **17** (1895): 529–538. **Günther.**
C. G. Ehrenberg und die wissenschaftliche Erdkunde. Von Professor Dr. Siegmund Günther.

Recalls the services to scientific geography of Ehrenberg's microscopical work, especially by his researches on aërial currents through the nature of blown dust.

Götzen. *Deutsche Rundschau G.* **17** (1895): 470–471. ———
Der Afrikareisende Adolf Graf. v. Götzen. *With Portrait.*

Hirschfeld. **Prutz.**
Gustav Hirschfeld. Gedächtnissrede, gehalten in der Königsberger Geographischen Gesellschaft am 24 Mai, 1895. Von Hans Prutz Königsberg in Pr.: R. Leupold, 1895. Size 9 × $6\frac{1}{4}$, pp. 22

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Lettres de Constantin Huygens à Descartes. Publiées par Charles et Henri Adam. (Extrait de la *Revue Bourguignonne de l'Enseignement supérieur*, année 1895.) Size 9 × 6, pp. 48. *Presented by the Author.*

Constantine Huygens, whose letters to Descartes are here printed, was the father of Christian Huygens, the celebrated mathematician.

Kayser. *Ann. Hydrographie* **23** (1895): 323–324. ———
Dr. Johannes Kayser.

The late Dr. Kayser of Breslau was the author of several important works on Oceanography.

Lahontan. *P. and T.R.S. Canada* **12**, 1894 (1895): 65–192. **Roy.**
Le baron de Lahontan. Par J. Edmond Roy.

A complete biography of Louis Armand de Lom d'Arce, from whose account of his stay in North America from 1683 to 1693 correct ideas of Canada first became popularly known in Europe.

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In Memoria di Carlo Piaggia; conferenza letta il 23 settembre 1894 . . . del Dott. Avv. Federigo Bonola Bey. Lucca: Tip. Baroni, 1895. Size 9 × 6, pp. 32. *Presented by the Author.*

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In Memoriam. Charles Ploix. 21 Février, 1895. [Par Henri Cordier.] (Extrait de la Revue des Traditions populaires.) Baugé: Imp. Daloux, 1895. Size 10 × 6½, pp 8. *With Portrait. Presented by the Author.*

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Commemorazione del Principe Eugenio Ruspoli. Discorso del consigliere prof. Elia Millosevich. *With Map and Portrait.*

GENERAL.

Ballooning. *Mém. S.R.G. d'Anvers* **4** (1895): 235–270. **Wouwermans.**
Contribution à la bibliographie de la locomotion aérienne. Par Armand Wouwermans.

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Le problème bibliographique. Par M. Marcel Baudouin.

Bibliography—Colonial. **Petherick.**
The Torch and Colonial Book Circular. Including classified lists of New Publications—English, American, and Colonial—in all departments of Literature, Science, and Art. Edited by Edward Augustus Petherick. London: E. A. Petherick & Co., 1887–1892. Size 10½ × 7½. *Presented by E. A. Petherick, Esq.*

Mr. Petherick has presented to the Society this handsome volume, containing all that was published of his valuable periodical of colonial bibliography. It fills a gap in the Library.

Bibliography, Greek. **Sakkelionos.**
Εθνικη Βιβλιοθηκη της Ελλαλοσς. Καταλογοσς των Χειρογραφων της Εθνικης Βιβλιοθηκης της Ελλαδοσς Υπο Ιωαννου Σακκελιωνοσς. Και Αλκιβιαδου Ι. Σακκελιωνοσς. Athens, 1892. Size 10 × 7, pp. 340. *Plates.*

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Index to the Periodicals of 1894. [Vol V.] London: *Review of Reviews* Office, 1895. Size 10 × 8, pp. viii. and 182. *Presented by the Compiler.*

A useful subject-index of the principal contents of the more important monthly and quarterly magazines and reviews. To judge by the treatment of articles from the *Geographical Journal*, the work is done with care and discrimination.

British Empire. **Cuningham.**
A Scheme for Imperial Federation, a Senate for the Empire. Three articles reprinted, with additions, from *The Westminster Review* of April, July, and October. 1879. By Granville C. Cuningham. With an Introduction by Sir Frederick Young, K.C.M.G. London: Longmans & Co., 1895. Size 8 × 5½, pp. xii. and 116. *Price* 3*s.* 6*d. Presented by the Publishers.*

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Proceedings of the Church Missionary Society for Africa and the East. Ninety-sixth year, 1894–95. London: Church Missionary House, 1895. Size 8½ × 6, pp. lxx., 346, and (358). *Maps. Presented by the Church Missionary Society.*

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Report on Governmental Maps for use in Schools. Prepared by a Committee of the Conference on Geography held in Chicago, Ill., December, 1892. [Davis King Collie.] New York: H. Holt & Co., 1894. Size 8½ × 5½, pp. 66. *Price* 2*s.* 6*d.*

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Sinn und Behandlungsweise der "Politischen Geographie" im Schulunterricht. Von Alfred Kirchhoff.

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Der erdkundliche Unterricht nach den neuen Lehrplänen. Von Dr. R. Langenbeck, in Strassburg i. E.

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Gogol géographe. Par P. Camena d'Almeida.

A sketch of the method of geographical instruction proposed by the Russian dramatic poet Gogol, published in Russian in 1831 and 1834.

Educational—Russian Text-Book. **Steinhauer.**

I. S. Steinhauer. First lessons in geography, arranged for use in schools with non-Russian populations. [In Russian.] St. Petersburg: N. P. Karbasnikoff, 1895. Size 9½ × 6½, pp. iv. and 92. *Presented by the Author.*

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Cours de Géographie rédigé conformément au nouveau programme d'admission à l'École Spéciale Militaire. Par J. Molard, France. Paris: Jouvet & Co., 1892. Size 7½ × 5, pp. xii and 376. Atlas accompanying. Size 12½ × 10.

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Figure of the Earth. **Jordan.**

The Cardioid Earth. By William Leighton Jordan. London: Spottiswoode & Co., 1895. Size 8½ × 5½, pp. 18. *Presented by the Author.*

Mr. Jordan refers to the cruise of the *Challenger* in relation to the figure of the Earth.

Fisherman's Nautical Almanack. **Olsen.**

The Fisherman's Nautical Almanack and Tide Tables. A Directory of British and Foreign Steam Trawlers, Smacks, etc. By O. T. Olsen. [20th year,] 1896. London: J. D. Potter [1895]. Size 7½ × 5, pp. 408. *Price* 1s. *Presented by the Author.*

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C. R. Osten Sacken. Additional Notes in explanation of the Bugonia-Lore of the Ancients. Heidelberg: J. Hoerning. London: R. H. Porter, 1895. Size 9½ × 6, pp. 24. *Presented by the Author.*

Ice. *J. Franklin I.* **140** (1895): 355–370, 437–455. **Vedel.**

On the Growth and Sustaining Power of Ice. By P. Vedel.

A mathematical treatise to ascertain the bearing power of ice under various strains. It is noted incidentally that "2-inch ice will sustain a man or properly spaced infantry; 4-inch ice will carry a man on horseback, or cavalry, or light guns; . . . 8-inch ice a battery of artillery, . . . but not over 1000 lbs. per square foot on sledges. . . . On 15-inch ice railroad tracks are often laid and operated for months, and 2-feet thick-ice withstood the impact of a loaded passenger car after a 60-feet fall (or perhaps 1500 foot-tons), but broke under that of the locomotive and tender (or perhaps 3000 foot-tons)."

International Statistical Institute. ———

Bulletin de l'Institut International de Statistique. Tome IX. Première Livraison. Rome, 1895. Size 10½ × 7½, pp. viii, 124, 54, and [28].

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Rôle des voyageuses françaises dans la géographie. Par M. J. V. Barbier.—Congrès National des Sociétés Françaises de Géographie. XV^e^ Session, Lyon, 1894. Compte rendu des travaux du Congrès. Lyon: E. Vitte, 1895. Size 10 × 6½, pp. 256–283.

Planetary Geography. *Le Globe B.* **34** (1895): 119–131. **Gautier.**

Mars et la Terre: aréographie et géographie comparées. By M. le Professor Raoul Gautier.

A comparison of the observed conditions of the surface of Mars with those of the Earth.

Sixth International Geographical Congress. **Friederichsen.**

Der Sechste Internationale Geographen-Kongress in London. (26 Juli–3 August, 1895.) Von L. Friederichsen. Separatabdruck aus den Mittheilungen der Geographischen Gesellschaft in Hamburg. Size 9½ × 6½, pp. 28. *Presented by the Author.*

Sport. **Phillipps-Wolley.**

Big Game Shooting. By Clive Phillipps-Woolley. With contributions by Sir Samuel W. Baker, W. C. Oswell, F. J. Jackson, Warburton Pike, and F. C. Selous; Lieut.-Colonel R. Heber Percy, Arnold Pike, Major Algernon C. Heber Percy, W. A. Baillie-Grohman, Sir Henry Pottinger,

Bart., Earl of Kilmorey, Abel Chapman, Walter J. Buck, and St. George Littledale. [The Badminton Library.] 2 vols. Second Edition. London: Longmans & Co., 1895. Size 8 × 5½, pp. (vol. i.) xvi. and 454; (vol. ii.) x. and 444. *Illustrations. Price* 21*s.*

Travel. *Globus* **68** (1895): 320–323. **Tamai.**

Eine japanische Reise um die Welt vor 100 Jahren. Uebersetzt von Kisak Tamai, aus Japan, z. Z. in Berlin.

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(2) Der Tebulos u. Basch-Lam Stock. Scale 1:220,000 or 3·4 stat. miles to an inch. Petermann's 'Geographische Mitteilungen.' Ergänzungsheft No. 117, Tafel 2. Gotha: Justus Perthes, 1895. *Presented by the Publisher.*

England and Wales. **Ordnance Survey.**

Publications since December 7, 1895.

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Fremde Volksstämme in Deutschen Reiche verglichen mit der Verteilung der Christlichen Hauptbekenntnisse, auf Grund der neuesten amtlichen u. ausseramtlichen Aufnahmen gemeindeweise bearbeitet von Paul Langhans. Auf Vogels Karte des Deutschen Reichs in Stieler's Hand-Atlas. Scale 1: 1,500,000 or 23·7 stat. miles to an inch. Petermann's 'Geographische Mitteilungen,' Jahrgang 1895, Tafel 17. Gotha: Justus Perthes. *Presented by the Publisher.*

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Geologische Karte des Deutschen Reichs, auf Grund der unter Dr. C. Vogels Redaktion in Justus Perthes' Geograph. Anstalt ausgeführten Karte in 27 Blättern in 1: 500,000 (or 7·9 stat. miles to an inch), bearbeitet von Dr. Richard Lepsius. Gotha: Justus Perthes, 1895. Lieferung V. Blatt 19, Dresden; 20, Görlitz. Lieferung VI. Blatt 12, Münster; 21, Breslau. *Price* 3 *marks, each part containing* 2 *sheets.*

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Vegetations-Karte des Peloponnes. von Dr. Alfred Philippson. Scale 1 : 625,000 or 9·8 stat. miles to an inch. Petermann's 'Geographische Mitteilungen,' Jahrgang 1895, Tafel 18. Gotha: Justus Perthes, 1895. *Presented by the Publisher.*

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Geologische Karte des Südostlichen Island, von Th. Thoroddsen. Reduziert nach der Originalkarte in der Zeitschrift d. Königl. Danischen, Geogr. Ges. v. 1895–96. Scale 1 : 1,000,000 or 15·8 stat. miles to an inch. Petermann's 'Geographische Mitteilungen,' Jahrgang 1895, Tafel 19. Gotha: Justus Perthes, 1895. *Presented by the Publisher.*

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Topographischer Atlas der Schweiz im Massstab der Original-Aufnahmen nach dem Bundesgesetze vom 18, Dezember 1868 durch das eidg. topogr. Büreau gemäss den Direktionen von Oberst Siegfried veröffentlicht. Scales 1 : 25,000 or 2·5 inches to a stat. mile, and 1 : 50,000 or 1·25 inches to a stat. mile. XLV. Lieferung. 382, Isenthal; 420, Ardez; 430, Les Plats; 434, Biere; 436, Aubonne; 436bis, Rolle; 437bis, Bouches de la Dranse; 443, Begnins; 474, Vouvry; 474bis, Pas de Morgins; 514, Locarno; 537, Brissago. *Price* 1 *mark each sheet.*

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Asia Minor. **Diest and Anton.**

Itinerar-Aufnahmen im nordwestlichen Kleinasien (Bythynien und Galatien). Ausgeführt im Mai-Juni 1892 und April-Juni 1893, von Major v. Diest und Premierlieutenant Anton. Scale 1 : 250,000 or 3·95 stat. miles to an inch. Petermann's 'Geographische Mitteilungen.' Ergänzungsheft, No. 116, Tafel 1, 2, & 3. Gotha: Justus Perthes, 1895. *Presented by the Publisher.*

Indian Government Surveys. **Surveyor-General's Office, Calcutta.**

Indian Atlas, 4 miles to an inch. Sheets: 61, parts of districts Malabar, Coimbatore, Madura, and Salem (Madras Presidency), and of district Mysore (Mysore Native State) and Coorg; 65, parts of Bisahir (Kanawar), and the Native State of Teeree (Foreign Gurhwal), of Tibet, and of districts Kangra (Punjab), Gurhwal, and Almora (N.W. Provinces); 107 parts of districts Sambalpur, Patna and Kalahandi (Central Provinces), Band, Daspalla, etc. (Orissa Tributary States), and Goomsur, Kimedi, Jeypore, and Ganjam (Madras Presidency); 112, parts of districts Darbhanga, Muzaffarpur, Patna, Gaya, Hazaribagh, etc. (Bengal); 120, parts of districts Nadia, Burdwan, Jessore Faridpur, Dacca, etc. (Bengal). Quarter Sheets; 2 S.E., parts of districts Kurachi, Jhirruk, Sehwan, etc.; 23 S.E., parts of districts Surat and Broach, of Native States Baroda, Rewa, Kantha, and Surat Agencies (Bombay Presidency); 48 N.W., parts of districts Umballa, Ludhiana, and Karnal, and of Patiala, Nabha, etc. (Punjab); 59 N.W., parts of districts Shimoga and Chitaldroog (Mysore State). Preliminary edition: 66 N.E., parts of districts Almora and Garhwal (N.W. Provinces), and Hundes (Tibet); 66 N.W., parts of districts Garhwal, Dehra Dun, and Native State Tehri Garhwal (N.W. Provinces); 70 S.E., parts of districts Damoh and Jubbulpore (Central Provinces), and of Native States Panna, Ajaigarh, and Maihar (Central India Agency); 87 S.E., parts of districts Azamgarh, Gorakhpur, Basti, Fyzabad, etc. (N.W. Provinces and Oudh); 105 N.W., parts of districts Lohardaga and Palamau, and of Sarguja and Jashpur States (Chota Nagpur), Bengal; 125 N.W., parts of districts Kamrup, Sylhet, Khasi, and Jaintia Hills, Garo Hills (Assam), and of Mymensingh (Bengal); 126 S.W., parts of districts Noakhali, Tippera, Dacca, Backergunge (Bengal), and Hill Tippera (Native State).—India, 64 miles to an inch, 4 sheets, additions to railways to 1895.—India, 64 miles to an inch, outline, 1895, 2 sheets.—Punjab Survey, 1 inch to a mile, Season 1867–84: No. 243, district Hissar and Bickaneer State; No. 260, district Hissar and Bickaneer State.—India, showing railways, corrected up to March 31, 1895, 80 miles to an inch.—North-West Provinces and Oudh Survey, 1 inch to a mile, Seasons 1866–91: No. 49 (2nd edit.), district Moradabad and Rampur State; No. 64 (2nd edit.), districts Naini

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Carte topographique de l'Algérie. Scale 1 : 50,000 or 1·25 inches to a stat. mile. Service géographique de l'Armée, Paris. Sheet: No. 50, Sidi Merouane; No. 107, Beni bon Douane; No. 243, Taria. *Price* 1 *fr.* 50 *c. each sheet.*

French Congo. **Hansen.**

Congo Français. Carte dressée à l'échelle de 1 : 1,500,000 (or 23·7 stat. miles to an inch). Paris, 1895. Service géographique des Colonies. 2 sheets, with index. *Presented by M. le Ministre des Colonies, Paris.*

This is an important map, in the compilation of which the most recent and reliable material has been used. All the principal routes of travellers are shown in red, together with the date of the exploration. Insets are given of the country between Lake Chad and the Nile, and the Lower Congo district.

AMERICA.

Colombia. **Simons.**

Carta Corográfica del Departamento de Bolivar. Levantada de órden del Gobierno General. Por Federico A. A. Simons, Ingeniero. Bogotá, 1895. Scale 1 : 785,000 or 12·3 stat. miles to an inch. W. & A. K. Johnston, lithographers, Edinburgh & London.

Carta Corográfica del Departamento del Magdalena. Levantada de órden del Gobierno General. Por Federico A. A. Simons, Ingeniero. Bogotá, 1895. Scale 1 : 810.000 or 12·7 stat. miles to an inch. W. & A. K. Johnston, lithographers, Edinburgh & London. *Presented by the Author.*

These maps of the Departments of Bolivia and Magdalena have been specially prepared for the Colombian Government by Mr. A. A. Simons, who has been employed for a considerable time in making compass surveys in order to correct existing maps. All means of communication are shown, and they contain a large amount of additional information.

CHARTS.

Pacific Ocean. **U.S. Hydrographic Office.**

Pilot Chart of the North Pacific Ocean, December, 1895. Published monthly at the Hydrographic Office, Bureau of Navigation, Department of the Navy, Washington, D C. Charles D Sigsbee, Commander U.S. Navy Hydrographer. *Presented by the U.S. Hydrographic Office.*

GENERAL.

Historical Geography. **Schrader.**

Atlas de Géographie Historique. Ouvrage contenant 54 grandes Cartes doubles en couleurs, accompagnées d'un Texte historique au dos, et d'un grand nombre de Cartes de Détail, Figures, Diagrammes, etc. Par une Réunion de Professeurs et de Savants sous la direction Géographique de F. Schrader, directeur des travaux cartographiques de la librairie Hachette et Cie. Parts 15, 16, 17. Paris: Librairie Hachette et Cie, 1895. *Price* 1 *fr.* 50 *c. each part.*

The following maps are contained in these parts:—Part 15, Empire D'Alexandre, with insets; France Féodale; L'Amérique au XIXe Siècle. Part 16, La Conquête de la France par la Royauté Capétienne; Allemagne et Italie en 1815 et en 1866; Monde Musulman. Part 17, Croisades; Le Domaine de la Guerre de Cent Ans; Europe de Charles-Quint et de Soliman. In addition to the principal maps there are numerous plans and insets, and explanatory letterpress is given on the back of each sheet.

PHOTOGRAPHS.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

137° 30′ 138°

TOYAMA BAY

Yamanobo

Himegawa

Kurobegawa

Renge mine

Orengeyama

Jinzugawa

TOYAMA

Jogwanji-gawa

Kamidaki

E T C H U

Hot Spring

Tateyama

Aoki-ko

Yugawa

Onsen

Hariноki toge 8120

Otobi-san

Kurobe

Omachi

30′

Kurodake

Yarigatake

Kasadake

Hodakayama

Jonendake

Iwahara

Funatsu

Sugoroku

Gamada

Nakao

MATSUMOTO

Hirayu

Abo toge 6460

Hashiba

Onogawa

Adzusagawa

Takayama

Norikuradake

YEZO

H I D A

Nomugi toge

SEA OF JAPAN

PACIFIC OCEAN

36°

Osaka

Ontake

Odaki

TOKYO

Fujiyama

H O N D O

SHIKOKO

KIUSIU

130 135 140 145

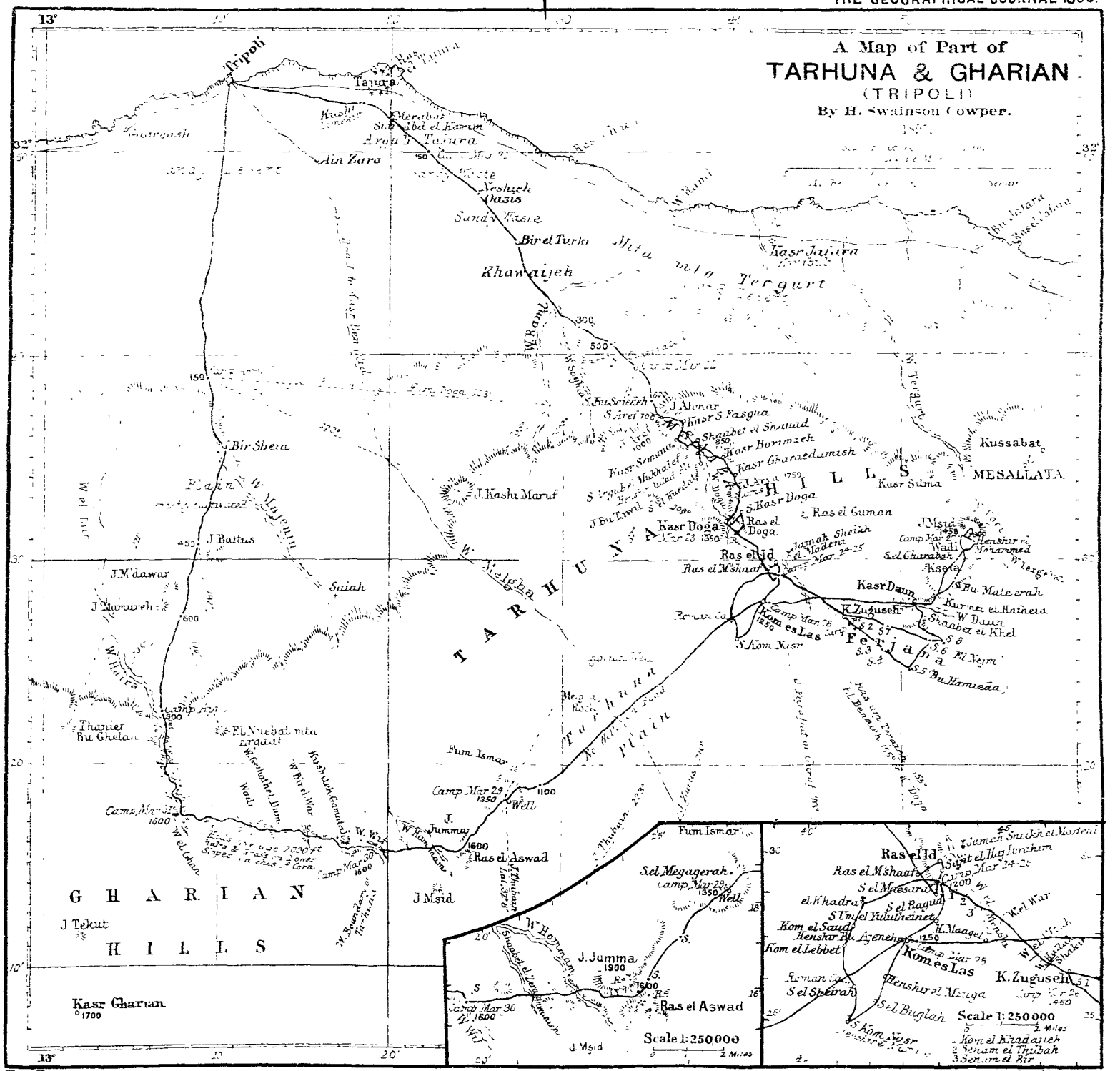
137° 30′ 138°

SKETCH MAP
of
THE JAPANESE ALPS
TO ILLUSTRATE THE PAPER
of
REV. WALTER WESTON.

Scale of miles
0 5 10 15
1 inch = 6.35 miles = 1.400000 (approx.)
Route

INDEX MAP
of
JAPAN.

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MOVEMENTS OF THE EARTH'S CRUST.*

(Bradyseisms, Earthquakes, Diurnal Waves, Tremors.)

By JOHN MILNE, F.R.S., F.G.S.

When we reflect upon the attention devoted to the observation of heavenly bodies, the changes that take place in the atmosphere, and the tides and currents in seas and oceans, it seems remarkable that so little has been done for the study of the movements of the so-called *terra firma* on which we live, and in building foundations to carry instruments which measure and record phenomena which take place above and round about.

If we except earthquakes, which from time to time attract a momentary attention by their violence, the reason that the more universal movements which are in operation beneath our feet receive so little attention is probably that they are not appreciable to our feelings. We cannot see a coast-line sink or rise, but that such things have happened, and that they may yet be in operation, is a deduction based upon a variety of evidence. We do not see tall buildings slowly moving to and fro with a diurnal period; nor do we perceive by any of our senses that there are times when certain instruments behave as if the foundations on which they rested were spasmodically breathing. Although a physicist may tell us that on a certain day a change in level is in operation, our knowledge of this, like that of many other earth-movements, depends upon hearsay.

While saying something about earthquakes, the object of the following short paper is to indicate the character of movements which are either too slow or too small to note with our unaided senses, and to

* Paper read at the Royal Geographical Society, February 10, 1896.

point out the scientific and practical advantages which result from their study. We shall refer to them in the order of their relationship to each other—those with an orogenic origin, like bradyseisms and earthquakes, being taken first; whilst those like diurnal waves and tremors, the existence of which may depend upon meteorological conditions, are taken last.

Bradyseisms.

The first movements to be touched upon are the *slow* or bradyseismic motions of the Earth's crust which, relatively to sea-level, result in elevation or depression. The manner in which these are produced by a shell too weak to be self-supporting, folding and crumpling as it accommodates itself to a shrinking nucleus, is a theory sufficient to explain the existence of mountain ranges, the uplifting of strata which were once beneath the sea, and many of the more important features of the lithosphere. We shall treat of these movements in relation to continental development, geological history, and to what has been observed to occur during historical periods and a lifetime.

When studying the evidences we have of bradyseismal changes, the first inquiries relate to their magnitude, their form, and the rapidity with which they are performed.

As it is usually only the vertical component of these movements which is measured, and this relatively to ocean-level, a debatable point that presents itself relates to the fixity of this datum. We know that the oceans form a body of water always moving towards a position of equilibrium; that much has been written to show that by absorption a general lowering of level is in operation; that by sedimentation and the release of aqueous vapour from heated rocks, a movement in the opposite direction may be taking place; that by alterations in the position of the Earth's centre of attraction, and by other causes, there may have been changes in the configuration of the oceanic envelope. But putting these considerations on one side—partly because they result in long-continued uniformity of change in one direction—we may ask ourselves how far secular movements have resulted in real elevation or depression, and how far they are only apparent movements due to the rising or falling of the water.

The phenomenon we wish to consider is similar to that which takes place when we raise or lower an apple in a basin of water. When it is lowered the water rises, when it is raised the water falls, and the volume of the immersed solid is equal to the volume of the displaced fluid. If the rim of the basin was flat or saucer-like, over such a surface there would be large horizontal displacements of the water-line.

Applying such ideas to what may possibly have taken place during the growth of the habitable portion of the world—a great part of which we know was at one time beneath the surface of the waters—and

assuming that there was at some particular period in the world's history a universal, or nearly universal, ocean, if we have not considered the matter before, we reach a somewhat unexpected result. Because we know the volumes and areas of the oceans, and the areas and average heights of the continents above sea-level, if the latter have been raised above the former when it extended over the whole globe, then out of an apparent average elevation, usually estimated at about 1000 feet, 250 feet of this would be due to the recession of the waters. A measure of the *area* of existing land surface which may in this manner have been only apparently elevated, may be realized by noticing the area which would be covered if the present sea-level could be raised 250 feet.

Regarding the evolution of continental areas in this manner, we see that the retreat of the ocean may have played a part quite commensurable with that attributed to bradyseismical movement. Should we dismiss, as being improbable, the idea that at any period of continental development there has ever been an almost universal ocean, and only consider the elevations which have taken place within the range of geological history, we still see that secular movements have been accompanied by considerable changes in ocean-level, and still greater in ocean-area. In discussing this question, the *à priori* assumption is, that when any area rose above the waters, it is unlikely that there should have been at the same time, in some other region, a subsidence beneath the water, and even if such contemporaneous but opposite movements had an existence, it is still more unlikely that they should have been volumetrically equal. Granting this hypothesis, as an example of what is likely to have occurred at times well within the limits of the geological horizon, we may take the two great mountain-forming epochs in the world's history. About the close of the Palæozoic era, the Urals in Europe, the Himalayian-like Appelachians, and other mountain ranges were formed.

In early Tertiary times, the Alps, the Pyrenees, the Carpathians, and the Himalayas were growing upwards, whilst a series of islands were slowly uniting to form the Apennines and the Italian peninsula. The complexity of the folds and the faulted and contorted strata out of which these masses are built, taken in conjunction with the step-like arrangement of sea beaches and terraces, suggest the idea that processes of elevation are intermittent. As these mountains were slowly growing, relatively to the Earth's centre, certain tracts of the rocky crust would rise, others would fall, and there would be a universal contraction in oceanic areas.

With a ratio of land and water areas in early Tertiary times of 1 : 4, and a mean height of the mountains then elevated of 4000 feet, which is the present mean height of Switzerland, the vertical fall in ocean-level would be about 26 feet. This calculation of the fall in the waters

does not include that which would accompany the rise of the extended fold or dome on which the mountains stand, and the figure given is therefore probably much below the truth. The meaning of this retreat of the waters in relation to the history of oceanography is, that at the times when mountains were formed, an intermittent withdrawal of waters, which would be marked on shallow coasts, took place throughout the world, and extensive tracts would be bared, not by the rising of the land, but by the falling of the waters.

Although mountain ranges might, as they rose upwards, increase their distance from the Earth's centre, flanking regions, by approaching this centre at a greater rate than that at which the waters were falling, might be submerged. Accepting the idea of rapid sedimentation at certain points along these intermittently sinking coast-lines, and we have conditions for the accumulation of a series of strata such as are found in many coal-fields, and it is certainly remarkable that these two periods of mountain growth were closely coincident with two great periods of coal-formation. If we do not accept this suggested connection between mountain growth and the deposition of strata accompanying the occurrence of the formation of coal, not only have we to fall back upon the usual explanation that the coal-measures were formed when there was a nicely adjusted balance between the rate at which an area was depressed and the rate at which the same was rising by sedimentation, but we are left to explain why such an adjustment was only marked at two particular epochs in the Earth's history, and why it simultaneously occurred at so many points upon the surface of the globe, which, for carboniferous coal at least, lie between 20° and 60° N. lat. and 20° and 40° S. lat., in regions of bradyseismical action.

Although a relationship might be traced between pronounced secular movements, volcanic action, and other geological phenomena, the main object of the present section of these notes is to show that, although we may take sea-level as a datum relatively to which changes taking place within the historical period may be approximately measured, directly we attempt to measure the magnitude of upheavals with which the geologist has to deal, unless we make our datum at the Earth's centre, or at some fixed distance from the same, it seems possible that some of our results may exceed the truth by 25 per cent.

In Japan, as in many other countries, notably perhaps Italy, bradyseismical movements have, during historical times, taken place with great rapidity. With the assistance of Prof. D. Kikuchi, of the Imperial University of Japan, a few years ago, circulars were sent to officials at all the important seaports and villages round the coast, asking them to collect evidences whether, during recent times or within the memory of the oldest inhabitants, any changes had taken place in the relative positions of the sea or land. The replies, which were numerous, showed that, along the eastern side of the country in

particular, elevation had been in progress, this being particularly noticeable in districts where earthquakes were frequent.

Information gathered in this manner, taken in conjunction with the writer's repeated observations on sea-terraces, shell-borings in rocks well above high-water mark, and other appearances, it may be concluded that movements along certain portions of the Japanese coast have been exceedingly rapid—possibly an inch per year. At one point, where soft tuff rock projects into Yedo bay beneath the bluff at Yokohama, lines of shell-borings can be seen fully 10 feet above high-water mark. Because the rock is so friable and soft, it is difficult to suppose that these markings have been exposed to atmospheric influences for a length of time very much greater than fifty years. Be this as it may, the writer well remembers that nineteen years ago it was impossible to pass round a neighbouring point of similar rock, whilst now at low water it may be walked round, not over drift or shingle, but over a rocky surface. There are no reasons for supposing that these changes in the relative positions of land and water on the coast of Japan which are here referred to, have taken place suddenly. It must, therefore, be supposed that they have either been brought about by the gradual elevation of the land, or by the gradual withdrawal of the water. The Japan current, or Kuro Siwo, which flows up the eastern coast of Japan, and which is comparable with the Gulf Stream in the Atlantic, has, like other oceanic circulating systems, marked seasonal changes in its velocity, and the distance to which it is appreciable.

Although we have no definite data respecting the greater changes which may take place in the magnitude and velocity of ocean currents, owing to gradual but periodic changes in climatic conditions, possibly culminating in periods of glaciation, it is highly probable that such changes have an existence, and if they do exist, it is difficult to suppose that they have been unaccompanied by alterations in the general level of the oceans, and to some degree in variations in the amount of water held back in bays and estuaries, especially those which have narrow entrances.

Notwithstanding these considerations, the occurrence of earthquakes, the crumpled rocks intersected by numerous faults, and other phenomena, incline us to the belief that the eastern coast of Japan is growing in consequence of the movements of the rocky crust rather than by a recession of the waters.

Whether the measurement of these movements which bring about such rapid changes are phenomena of sufficient importance to attract the attention of harbour and other engineers, is a question that cannot be answered until they have been more accurately determined. The importance of forming a trustworthy estimate of the rate at which the larger folds of the Earth's surface have been formed, or by which mountains may be increased or decreased in height, is evident to all students of Earth physics.

The only experimental determinations of these changes are the well-known measurements which were made between marks cut upon certain rocks and sea-level in Sweden. The method, although apparently certain, has its objections. The fact that differences in level can only be observed after long intervals of time is in itself an objection, while the fact that during such intervals, by variations in ocean currents, by sedimentation, elevation or depression at the entrance to a closed sea, like the Baltic, along the shores of which the marks referred to were made, the play of the tides, relative to a phase of which the measurements must be taken, may have suffered alteration.

Results might possibly be obtained in a quicker and more certain manner by differential measurements of the records of three or more tide-gauges referred to neighbouring bench-marks. In a nearly closed bay, like that of Yedo, where the tide is small, it would be possible to choose times when tides had similar phases, and when we could assure ourselves that the surface of the water had the same configuration. Taking observations made at these times, although total rise relatively to a certain phase of tide may be measured, the chief determination would be the relative rising or falling of one point of land as compared with another, together with the axis of such a movement.

Several other methods of obtaining similar results suggest themselves, the simplest of all being the installation underground of several levels parallel and at right angles to the dip of strata. Under these conditions, where changes of temperature would be inappreciable, and where readings would only be required at long intervals, the ordinary spirit-level would be sufficient for the suggested purpose, but, to avoid effects due to the creeping of the soil, the levels should be placed upon the solid rock. With such an installation in Japan, where we know that movements are taking place with comparative rapidity, it is not unlikely that definite measurements of tilting could be obtained in a very few years.

From the observations of levels placed in a cellar, Plantamour has shown that there are long period displacements in the position of their bubbles. Astronomers observe slow changes taking place in solid masonry piers which carry telescopes, and von Rebeur-Paschwitz has recorded the wandering of the zero-point of his horizontal pendulums. In Japan it has been observed that two of these latter instruments, placed 1000 feet apart, have synchronized in the directions of their displacements, slowly creeping for ten or many more days in one direction, and then returning to travel past their starting-point in an opposite direction. Although these instruments may only show changes of 1 or 2 inches of elevation per mile, it is premature to assume that what has been recorded is due to secular changes in the inclination of the Earth's crust. Movements of this nature may be due to the gradual creeping of a layer of soil upon a slope, to the differential loading or removal of moisture on two sides of an observing-station, and possibly to other causes.

Therefore, until levels or horizontal pendulums have been established in duplicate in the suggested manner upon rock, we shall be unable to say that secular movement has been instrumentally measured or recorded.

Earthquakes.

To pass from movements which are accomplished so gently and so slowly that they are neither felt nor seen, to violent disturbances called earthquakes, which in a few seconds may alter the superficial aspect of a country, although the transition is rapid, it is one that is natural.

The greater number of earthquakes may be regarded as announcements that a resistance to secular movement has been overcome, and if such an explanation of earthquake origin is sufficient, then the relationship of the former to the latter is that of a child to its parent. Wherever we find mountains which are geologically young, where the process of rock-folding may yet be in progress, there we find earthquakes. Should these regions of rock-movement be near a sea or ocean, we also find volcanoes. Volcanic eruptions accompany the generation of steam and gaseous pressure beneath lines of yielding; while earthquakes, if we except a few explosive efforts at volcanic foci, tell us that rocky strata, bending under the influence of terrestrial contraction, have exceeded their elastic limit. Although both may occur in the same country, it is seldom that their origins are close together. In Japan it is seen that active volcanic vents chiefly occur along the backbone of the country which forms the upper edge of a huge monocline, whilst the earthquakes are most frequent on the flanks of this fold, or where it sweeps steeply downwards beneath the deep Pacific. The home of the majority of earthquakes is that of the majority of faults, which is a region of monoclinal folding. That a volcano by its eruption acts as a safety-valve for the surrounding district, does not seem to be borne out by observation. Earthquakes and volcanoes are independent, excepting in their parentage, and if between them there is a closer union, we should expect that a relief of pressure following an eruption would result in farther bending of the strata, and an increase in seismic frequency. If it is, therefore, admitted that the majority of earthquakes are the result of fracture resulting from excessive bending, rather than attempting to predict their occurrence by our sensations, the behaviour of lower animals, or the assumption of tides acting on lines of weakness beneath a hardened crust, a more reasonable method of procedure would be to determine whether the earthquakes of a given district are preceded by measurable changes in inclination of the yielding surface. During the last few years of the writer's residence in Japan, with the aid of delicately adjusted horizontal pendulums, some attempt was made towards the solution of such a problem. The results showed that in a number of instances there was an indication of a connection between a uniform and steady change in level and the occurrence of many disturbances.

Because the observations were incomplete, and because there were difficulties in separating earthquakes of a local origin from those which had originated at a distance, the definite solution of this problem remains for future investigations.

From the records obtained in Japan from nearly one thousand observing-stations, we learn that during a period of eight years about nine thousand distinct shocks were recorded, and for each of these the approximate origin and the area that was sensibly shaken have been determined. The analysis of a catalogue of these disturbances shows that Japan may be divided into at least fifteen distinct seismic districts, the records from each of which may be examined separately, the different shocks being taken as numerically equal or have values given to them bearing a relationship to the area which each disturbed. The records from each of these districts give relative measures of the rate at which rock-folding is in progress in such districts, and we are enabled to examine how far these changes are influenced by tidal loads, variations in barometrical pressure, and other phenomena exogenous to the crust of our Earth.

From the study of a series of *after-shocks* which have followed several large disturbances, Mr. Ōmori has shown that, in particular cases considered, the rate at which the broken-up strata settled to a state of equilibrium practically followed the same law, from which it may be concluded that the character of the disjointed materials had been on the average fairly similar. One result of these investigations is that, having observed for a month or so the number of *after-shocks* occurring in a given district, and in this way determined the first part of a curve of frequency, this curve may be completed, and from it we can see how many shocks we may expect in a given number of months, or how many years it will be before the district has returned to its normal state of seismic sensibility.

If we take the records *en bloc*, the only advantage which the Japanese catalogue of earthquakes presents over other lists is its completeness, and the fact that the different records can have "weights" assigned to them. By examining these records, we find that for Japan, as for other countries and for the earthquakes of the world, there is an annual and semi-annual periodicity, the former of which, as Dr. C. G. Knott and Mr. C. Davison point out, may be the result of differences in barometrical stress at two seasons of the year.

For very many of the shocks recorded in Japan, seismographs, writing on stationary or moving surfaces, have given diagrams from which we learn how many vibrations have constituted a given disturbance, the rapidity with which they have occurred, and the extent and direction of each successive movement. The study of these diagrams has led to the conclusion that earthquake-motion, which may be *felt* for periods varying between a few seconds and several minutes, is of

different types, and that each type has a signification. If, for example, we feel a long, easy, rolling motion, at which time the diagram is that of a series of slowly recurring waves, the inference is that the origin of the disturbance causing this movement is at a considerable distance. If, however, an earthquake commences with a series of small but rapid vibrations, followed by a shock or shocks, and irregular sharp motions which die away gradually, then the origin is near, and it appears that the difference in time between the commencement of the tremors and occurrence of the first decided motion is proportional to the distance of the origin from the observing station. The interval of time between the commencement of preliminary tremors and the more violent movements, as shown by an ordinary seismograph, when the distance between the observing-station and the origin of the disturbance is not more than 200 miles, seldom exceeds ten seconds; but if the movement has been propagated to a very long distance, the interval may be many minutes. Should, for example, an earthquake originating in Japan be sufficiently intense that, by means of specially contrived instruments of great sensibility to elastic vibrations and angular displacement, its movements can be recorded at places distant one quarter or more of the Earth's circumference, then it is seen that the tremors appear upon the diagram half an hour before the maximum phases of motion. These latter motions are propagated to these distant places at a rate of two or three kilometres per second, or at about the same rate as they are propagated to places relatively close to an origin. The former, however, assuming that they actually originated at the same time from the same origin as their larger followers, have been transmitted at rates three or four times as quickly, and it becomes difficult to suppose that they have passed through the heterogeneous materials constituting the Earth's crust. To make careful observations on the rate of propagation of these tremors, and to determine the paths they have followed, are two of the most important problems which the seismologist is now asked to solve. Their velocity is somewhat reduced if it is assumed that, instead of passing round our Earth, they pass in straight or curvilinear lines *through* the same; but even with this assumption, we find that the rate of transmission has been greater than it would be had our globe the same constitution as glass or steel.

Our knowledge of the interior of the Earth is at present chiefly based upon the revelations of the thermometer and the plumb-line. Whatever information these may have given us, it does not seem improbable that after a seismic survey has been established for our world, the records of seismographs may add definite information about the effective rigidity of our planet, which, from the little that has already been accomplished, seems to be very much higher than has usually been supposed.

Although many of the investigations relating to earthquakes have apparently only yielded results of value to those engaged in researches

of a purely scientific nature, yet a certain number of them have led to results of practical utility.

From the diagrams of earthquakes, the maximum velocity of a particle and the acceleration or suddenness of motions which are the destructive elements of earthquake movement resulting in projection, overturning, and shattering, have been calculated. That these quantities are real has been verified by numerous experiments, in which columns of brickwork and other bodies have been moved back and forth by a recorded motion, until, by the reaction of their own inertia, they have either been fractured or overturned. The result of these experiments and observations in the field has established the truth of calculations based upon diagrams, and if, after a destructive earthquake, we determine the amount of motion that has been experienced, either from the dimensions and nature of bodies which have been overturned, or from the records obtained from seismographs, we arrive at what are practically identical results. In the great earthquake which, on October 26, 1891, devastated Central Japan, at which time nearly ten thousand people lost their lives, the greatest accelerations recorded varied between 3000 and 4000 millimetres per second per second. Earthquakes which shatter chimneys, partially unroof houses, cause plaster to fall, and which give to an ordinarily built town the appearance that it might present after a bombardment, have a suddenness in their back and forth motions of about one-tenth of the above quantities. From these and other measurements, an engineer, having assumed that a certain quantity of motion may be expected, is now in a position not simply to make a structure strong because an earthquake is strong, but he is able to proportion and distribute his materials to exactly fulfil certain possible conditions. For example, in the building of piers to carry a railway bridge, we know from experience that, when they are sufficiently shaken, fracture first takes place at their base. This form of destruction is identical with that which occurs when a column of brickwork is placed upon a truck which can be moved back and forth at a continually increasing rate. At the same time it is in accordance with what we should expect, which expectations are borne out by the results of theoretical investigations. From observations and considerations like these, we see that walls, columns, and structures like piers and chimneys, require greater dimensions or strength near their base than those given to them in ordinary practice. Forms having equal strength at all their horizontal sections against the effects of horizontally applied motion have been designed; and in Japan, as illustration of these, we have the parabolic brick piers, some of which are 110 feet in height, designed by Mr. C. A. W. Pownall, M.INST.C.E., to carry the Usui railway.

One remarkable observation which seismographic records have confirmed and measured is the fact that, outside an epifocal area, earthquake waves like those of the ocean are somewhat greater on the surface than

they are at a comparatively small depth. The inference from this is, that a building rising from a basement 10 or 20 feet in depth, surrounded by an open area, will receive less motion than a building rising from the surface. Many large and important structures in Japan have therefore been built to rise freely from moderately deep foundations, and on more than one occasion it has been observed that they have not in the slightest degree suffered, whilst their near neighbours have been so far shattered that in certain instances they have required rebuilding.

These are by no means the only beneficial results which have followed seismic investigations. Rules have been formulated for the guidance of an engineer when selecting a site. The unadvisability of having undue top weight, or connecting together structures having differences in their natural periods of vibration, and many other principles to guide the practical builder, have been demonstrated, and it is pleasing to record the fact that the demonstrations have not been altogether unheeded, with the result that, in Japan at least, the security of life and property is greater than it was in former years. Seismometry has directly led to the construction of instruments which faithfully record the jolts and vibrations of railway trains, which show the magnitude and position of irregularities along a line. Modified forms of these contrivances give faithful representations of the jerking due to the want of balance in a locomotive, by correcting which the Imperial Government railways of Japan effect a considerable saving in fuel and repairs. Other instruments, also claiming the seismograph with its steady points as parent, are able to record the peculiar earthquake-like vibrations of bridges and the elastic movements of buildings and steamships.

Although seismology owes its present position to individual efforts made in many countries, standing foremost amongst which are the remarkable results achieved by the late Dr. E. von Rebeur-Paschwitz, a great impetus was given to this study by the establishment of the Seismological Society of Japan, which, during its short existence of hardly fifteen years, issued twenty volumes of original papers. The result obtained by this body of Japanese and European workers acted as an incentive to further investigations in many directions. In Europe seismographs took the place of seismoscopes, whilst the Imperial Government of Japan established a special bureau, which now controls nearly one thousand stations for the purpose of earthquake investigation, and endowed a chair of seismology at its university.

Diurnal Waves.

From movements the cause of which are to be sought in the crust of the Earth, we pass to others which are apparently more ubiquitous, and owe their existence to phenomena connected with our atmosphere.

In Germany and Teneriffe, diurnal waves have been recorded and

carefully analyzed by the late Dr. E. von Rebeur-Paschwitz. In Japan, photographic records of these displacements have been obtained at many stations.

The most pronounced movements correspond to a slow tilting of the instruments for ten or twelve hours towards the east, followed by a retrograde motion towards the west. Accompanying this there is a north and south component of motion, which is definite but relatively small.

Von Rebeur found, after a careful analysis of his records, that whatever may have been the chief cause of these displacements, which amount to three or four seconds of arc, but at certain stations in Japan to several times this amount, a slight superimposed lunar effect may be detected.

The records of these movements, like those of tremors and unfelt earthquakes, are obtained by continuously photographing on a moving film the varying position of a horizontal pendulum. When the pendulum remains at rest the diagram is a straight line, but if, during a period of twenty-four hours, it wanders slowly to the right and then back to the left of its normal position, the photogram is a wave-like curve, the amplitude of which varies according to the sensibility of the instrument and the locality where it is installed, from 1 or 2 up to 20 millimetres. In Japan, the localities where pendulums were installed were selected for the purpose of studying these movements under varying conditions. Five sets of diagrams were obtained from instruments placed upon the solid rock in caves, where the daily change in temperature and hygrometric conditions was barely appreciable. At these stations it was observed that the movements due to earthquakes were most pronounced in a direction parallel to the dip, suggesting the idea that this direction is that of least resistance, parallel to which there is a concertina-like yielding in the folded strata. Together with the displacements due to the diurnal wave, the pendulums showed that they slowly wandered, moving several days in one direction, and then returning towards their starting-point. Tremors and daily waves were not visible. Had the sensibility of the pendulums, which, in the experiments in Japan, never exceeded a displacement on the film of 1 millimetre for an angular tilting of 0·1″, been greater, it is possible that the latter phenomena might have been observed. In Europe similar or corresponding instruments have had sensibilities given to them of 0·01″ to 0·003″. The latter degree of sensibility means that changes in inclination of 1 inch in about 1000 miles would be measurable.

Another station was in an underground chamber in the alluvium, where the daily changes in temperature, as in the caves, was extremely small, but where, in consequence of fairly good ventilation, there may have been considerable changes in hygrometric conditions. The depth of this chamber was 12 feet. The records showed wandering of the

pendulums, tremors, and daily waves, all of which were at times quite as pronounced as they were at stations on the surface.

These latter records lead us to the conclusion that diurnal waves are not to be attributed to the immediate effects of any change in temperature close to the instruments.

The remaining stations, where the instruments stood on brick columns with concrete beds, were on the alluvium, which near Tokio forms a layer of reddish stiff soil 50 to 100 feet in thickness, above a soft grey clay-like tuff rock. A locality at which the diurnal wave was hardly appreciable was in a wood. At this place there were high trees for some distance all round the hut in which the pendulum was placed, which protected it from the direct effects of the sun. On an open plain, where on one side of the station there was ploughed ground and on the others green corn, the movements were slight but fairly regular. They apparently indicated that during each day the ground covered with corn rose relatively to that which was bare. At all the other stations where the ground was covered with trees or buildings more upon one side than upon the other, the daily waves were large, and often differed in phase. For example, on two plateaux on the two sides of an open swampy valley, the instrument on one side of this having a protected area on its east side, and those on the other side a somewhat similar area on the west, moved at the same time in opposite directions—that is to say, if the trees on these two opposite scarps followed the movements of the instruments, it may be concluded that on each fine day they bowed towards each other.

A very important observation made at many stations was that *on wet and cloudy days diurnal waves were absent.*

The general conclusions to which the various observations point, is that the movements which take place during the day are due to the removal of a load from the side of the station most exposed to the effects of radiation, and in the alluvium this effect is quite pronounced to a depth of at least 12 feet. This load may be represented by aqueous vapour carried upwards and then dissipated.

On a fine day experiment shows that from moist open ground as much as one ton of moisture may be removed from an area 20 yards square. If an action of this sort is more marked upon one side of an instrument than upon another, then the ground by its resilience rises on the former side, and the pendulum swings away from the area which has been most relieved. In a similar manner, a load composed of men and boys marched up to one side of the station causes the ground on that side to sink, and the movement of the pendulum is towards the loaded side; when they retire, the pendulum returns to its normal position. For reasons like these, the instruments on the two opposite plateaux during the day move in opposite directions, or away from the intervening open valley, where unloading is most marked; while an

instrument on uniformly exposed ground or in a wood shows but little or no motion. That there is little or no motion during rainy or cloudy weather, is evidently due to the fact that at such times there is but little evaporation.

A desirable experiment would be to record the movements of a horizontal pendulum on a uniform and equally exposed prairie-like plain. In this case, because during the morning the sun would take away more moisture from the east than from the west side of the pendulum, until noon or about two in the afternoon, we should expect to find the motion westwards. After a pause, some time in the afternoon, a retrograde movement would set in and continue until some time after sunset, but both movements would be small.

From this we see that a pendulum which has been moving westwards may have the direction of its motion reversed; but the difficulty which presents itself is to explain the manner in which this retrograde motion, having been established, continues during the night, until it nearly returns to the position it had on the previous morning. The explanation of this phenomenon apparently rests on the fact that during the night the area which during the day has lost the greatest load may be the one which gains the greatest load. The establishment of this suggestion depends upon facts and experiments relating to the precipitation and condensation of aqueous vapour. On open ground where radiation is marked, there is a greater precipitation of moisture in the form of dew than there is upon ground which is protected by trees, buildings, or other coverings. The quantity of moisture which is in this way drawn from the atmosphere, or, as Aitken has shown, is trapped just as it rises from the ground, is however small, and cannot be taken as more than one-eighth of that which during the day has been moved by evaporation. Although it may assist in causing the reloading for which we seek, by itself it is insufficient to explain all that is observed; and, further, the retrograde motion of a pendulum may have taken place on nights when dew is not observable. On such occasions, however, a differential loading of two neighbouring areas may have been brought about either by the condensation of moisture on the immediate surface of the ground, beneath leaves and stones, or actually beneath but near to the surface.

If we look beneath a board which has been lying all night upon the grass, it does not unfrequently happen that its under side is wet with moisture, although the grass around may be dry. This observation suggested the idea that just as moisture is condensed beneath a board, a leaf, or a stone, so it may be condensed *in* the ground, within one or two inches of the actual surface. On a hot day moisture is evaporated from soil, and this is perceptibly heated to a depth of about a foot. Shortly after sunset the surface to a depth of one or two inches is chilled, or in winter it may be frozen. The result of this is that

moisture rising as vapour, and by capillarity from water-bearing strata below, is condensed on the under side of the chilled surface. To determine how far superficial soils gain in weight by an action of this description, independently of moisture precipitated from the atmosphere, or condensed as it rises from the ground, the following experiments were made.

Two boxes, each 1 foot 6 inches square, and about 2 inches in depth, were balanced on the extremities of beams carried upon knife-edges. One box had a bottom made of tin, and the other of fine wire netting, and each was filled with earth. Excepting when these were weighed by hanging weights at the other extremities of the beams, they were allowed to rest upon a bed of soft earth. Sometimes it was found that during a night both of the boxes would lose weight, but at other times it was found that the weight of the box with the tin bottom had not changed, whilst the one with the wire netting had gained from 2 to 2·5 ounces, which apparently showed that there had been a condensation of moisture coming up from beneath of 10 ounces per square yard, or about one-eighth of that which had been removed during the day by evaporation.*

Although the retrograde motion of a pendulum during the night is usually less than that which had taken place during the day, thereby causing a creeping of the zero point away from an area of rapid evaporation, the question is whether the precipitation and the forms of condensation which take place between sunset and sunrise are sufficient to produce the observed effects. Our data respecting sub-surface condensation are unfortunately confined to the few observations made by the writer, and many observations have yet to be made before its quantitative analysis has been completed. The greatest effect would be produced when each of these forms of condensation was at a maximum and acted in conjunction.

The difference in the weight of moisture evaporated from two neighbouring areas is apparently sufficient to cause the movements observed during the daytime, whilst the difference in the weights added to such areas from a water-supply common to each, is a phenomenon which may influence the movements observed at night.

These explanations, although they may be sufficient to account for many of the movements observed in Japan, because instances occur where their application is not clear, until they have received more careful attention, can only be received as provisional. At Potsdam, for example,

* In consequence of a fire which occurred at the writer's house, not only were the notes relating to these experiments destroyed, but the experiments themselves had to be terminated. Sub-surface precipitation is evidently closely related to a fact noticed by farmers upon the chalk downs in the Isle of Wight, who find that if the ground is cleared of flints, which means the depriving it of its radiators and condensers, its fertility is impaired.

where Dr. E. von Rebeur-Paschwitz tells me that the ground is equally covered with trees towards the east and west, the motions are quite pronounced, and the same authority has observed extraordinarily large motions on a strongly founded pillar, when there was apparently no motion in its neighbourhood.

An experiment which has yet to be made is to place an instrument upon a pillar, the two sides of which are unequally porous, with the object of determining whether any of the observed movements, especially tremors, which are described in the next section, can be traced to changes taking place in the supporting column.

NOTE.—From the researches of S. H. Miller, F.R.A.S. (Prize Essay on Evaporation, published by the Utrecht Society of Arts and Sciences, 1878), it would appear that the average daily quantities of evaporation for *particular* months are approximately as follows:—

Soil (humus; July)	4,243	lbs.	per sq. yd.
Water (July, 1869)	8,613	,,	,,
Forest (a spruce)	12,528	,,	,,
Grass (red clover; May)	15,613	,,	,,

These loads, which are removed during twelve hours of daylight, may be either greater or less than the quantities given. They are practically in the ratio of 1 : 2 : 3 : 4.

The greatest daylight displacement of a horizontal pendulum ought, therefore, to be expected when such an instrument was placed on the boundaries of two areas respectively covered with soil and grass. On a fine day the differential evaporation effect on the two sides of the instrument would be equivalent to removing a load of about $2\frac{1}{2}$ tons per 20 yards square from the ground covered with grass, which is quite sufficient to produce many of the observed effects.

EARTH-TREMORS.

The last class of earth-movements to which we have to refer are even more perplexing, and more frequently observed than the diurnal waves.

These are the earth-tremors, earth-pulsations, or microseismic motions, which were first systematically observed by Father Timoteo Bertelli of Florence. The method that Bertelli adopted prior to 1870—which was to observe, by means of a microscope, the movements of the style of a pendulum carefully sheltered from air-currents—is practically identical with the methods yet employed at very many stations throughout the Italian peninsula.

Amongst the more important results obtained by these observers, and confirmed by observations made in other countries, is that tremors were more frequent in winter than in summer, and when the barometer is low rather than when it is high.

In Japan during the last nineteen years these movements have been

studied by the use of a large variety of instruments, whilst for some years past the records have, by photographic or other means, been made continuous.

The analyses of a long series of these latter records have shown that tremors were usually at a maximum when the barometric gradient was steep, no matter whether, at the place where they were observed, the barometer was high or whether it was low. From this it may be concluded that when tremors are pronounced, somewhere or other, either at or within 100 or 200 miles distant from the point of observation, a strong wind may be blowing. This conclusion, which has been verified by an appeal to weather charts, led the writer at one time to regard local or distant winds as the immediate cause of microseismic storms. Although the mechanical action of wind upon buildings, trees, and the surface of the country may produce slight tremors and influence the character of a record, the fact that tremors are sometimes observed at the time of a dead calm around the station, and that they may not be visible when the building in which the instrument which renders them visible is being violently shaken during a heavy storm, has led observers to think that tremors are not the immediate effects of wind. The reason for the existence of tremors was next sought for in fluctuations in barometric pressure. During a typhoon the needle of an aneroid may be observed to pulsate back and forth, whilst the slow change in pressure over an area may, as von Rebeur has shown, produce sufficient alteration in level to be recorded by movements of a horizontal pendulum. When barometrical pressure is changing rapidly over a district, the parts of which offer different degrees of resistance to distortional effects due to varying pressure, the inference is, that such a district might be thrown into a state of irregular agitation sufficiently pronounced to cause the movements called tremors. Although tremors may perhaps be induced by causes such as these, and therefore be really the result of actual movement of the ground, a close inspection of photograms, and a knowledge of the localities where they were obtained and the character of the instrument which yielded the records, give rise to a suspicion that some of these intruders, which may mask effects due to distant earthquakes, and interfere with many delicate physical operations, are, in some cases at least, the result of movements of the atmosphere.

The instruments in the caves, where it was uniformly damp, and many of those situated in huts upon the surface, where the ventilation was so good that it was difficult to understand why the long booms of the horizontal pendulum had not been set in motion by currents of air, either never showed a trace of these movements, or, if they were shown, they were insignificantly small. With other instruments, some of which were well protected inside substantial buildings, and the possibility of their being affected by currents of air from the outside was

inconceivable, day after day tremors were pronounced. The difference between these two sets of installations was, that the pendulums showing tremors were either longer in proportion to their weight, or actually very much lighter than those which remained steady; and experiments showed that the smaller and lighter a pendulum was, the more closely it approached in character to the imaginary instrument endowed with perpetual motion. The conclusion derived from this observation was, that the so-called Earth-tremors might in some way or other be due to air-currents produced within the containing cases; but there was nothing making it likely that such currents were due to any marked difference in temperature between the parts of an instrument and its enclosing walls.

An experiment which tended to confirm this view was to place a tray of calcium chloride inside the case containing a horizontal pendulum, when it was observed that the pendulum commenced to swing. The meaning of this is that air-currents are produced by rapid desiccation, which is a cause of atmospheric circulation, which has a wide application, but which is seldom emphasized.

Assuming this explanation for the origin of *certain* so-called Earth-tremors to be correct, great difficulties occur when we attempt to explain the peculiarities they exhibit in the times of their occurrence.

If a tremor-storm extends for several days, it is noticed that maxima of movement occur during the night, or from 9 p.m. until 6 a.m. As the disturbance dies out, tremors will only be observed at these hours, until finally the disturbance will end with a little movement about 6 a.m. Some instruments have only shown movements about daybreak, whilst one showing a maximum motion about this time was always on the swing at night (Fig. 9). It will be observed, therefore, that tremors are frequent during the time that the portion of the diurnal wave is most gentle, and that the maximum of tremors occurs about the time when the reversal in the direction of the diurnal swing of a pendulum takes place. Although experiment has shown that the appearance of tremors can be produced by the removal of a heavy load at the distance of 100 feet from a pendulum, at which time it slowly heels over towards the relieved area, because they are often frequent when no daily wave is observable, it does not seem likely that there is any direct connection between these two phenomena.

The conclusion at which we therefore arrive is, that during the night, and especially about daybreak, in consequence of the absorption or giving-off of moisture within more or less closed cases, and possibly to a greater extent outside them, air-currents are produced which are sufficient to move light pendulums, and that some of these movements have been supposed to be caused by an actual movement of the ground.

By no means can all tremors be explained in this simple manner. For example, the horizontal pendulum, now working at Shide, which is

usually adjusted to have a period of seventeen seconds, often shows tremors extending over many hours, which have periods of from one to three minutes. It may be possible that air-currents have produced these movements, the character of which indicates a slow tilting of the instrument; but it seems unlikely, especially when it is seen that for several hours there has been no variation in the period or amplitude of the displacements (Fig. 7). The bulk of tremors seem to have their origin in causes which are meteorological; but we are yet waiting for a more complete explanation of the manner in which they originate.

Although we see in diurnal waves and tremors the results of meteorological phenomena which affect agriculture and forestry, the movements they represent usually present themselves as intruders which have not simply interfered with, but which have hopelessly destroyed certain physical operations.

Tremors brought investigations relating to lunar gravitation at Cambridge to an end; tremors may have been the cause of unsteadiness of images from long focal lenses, rendering accurate astronomical photography uncertain. Times have occurred, when making determinations of standard weights, that balances have been unsteady; and the writer has repeatedly observed delicate forms of these instruments, used in assay work, on the swing and often changing their zero-point. How far tremors may have accelerated or retarded the swing of pendulums in gravitational observations, we do not know. What we immediately wish to do in regard to tremors and diurnal waves is to find means to isolate ourselves from, or at least to minimize, their effects. We can entrench ourselves against the mechanical vibrations of a passing train by means of trenches, and the surveyor in a city can isolate his instrument against the same intruders by a suspension of rubber bands.

How far the study of the tremors which have here been described will enable us to avoid their effects or to destroy them, or to what extent a closer examination of these ill-understood phenomena will prove beneficial, are matters only to be decided after further investigation.

Before the reading of the paper, the PRESIDENT made the following remarks: The paper this evening, which we may expect to be of an extremely interesting and novel character, is by Professor Milne, on the movements of the Earth's crust. I will now call upon Professor Milne to read his paper.

After the reading of the paper, the following discussion took place:—

Sir ARCHIBALD GEIKIE: I think the Geographical Society is to be congratulated on having had from our great authority on earthquakes so luminous and so humorous a description of the subject as he has given to-night. I don't know whether it is a fortunate thing to live in an earthquake country, but Professor Milne's residence of many years in Japan has given him experience of more earthquakes than any other man of science in the world has had, and he has certainly devoted more time to the study of them. But not only has he given attention to

earthquakes, he has, in recent years, been studying the minute and almost imperceptible movements which Mother Earth is continually suffering. From the point of view of Geography, we ought specially to support the idea of having these movements carefully measured. The day for the kind of observations which were all that Mallet and his predecessors had to rely on, is past; we can get no more information as to the internal economy of the Earth from that source. What we want now is careful and critical measurement to explain the movements of the Earth's crust. The fitting up of ten or fifteen observatories would probably not cost very much, and even if, in two years, we could get only a part of what he has promised us, I think the expense would be well bestowed. There are various features of physical geography where such measurements might help us. "Old as the hills" is a familiar phrase, but the hills differ vastly in age, and many of them are growing still. We do not know the rate of their growth, but if we had such observatories fixed up, we might be able to watch from year to year the gradual movement, either upwards or downwards, of a mountain chain. Then, again, we know almost nothing of the source of earthquakes. Professor Milne, though familiar with many of their phenomena, has not yet been able to throw much light on their actual source. No doubt they arise from many causes, and possibly the instrument to which he has referred may enable him to classify the various earthquakes and say that they originated, some from one, some from another cause. These are some of the geographical aspects of the subject which he has brought before us. I rejoice very much to have listened to him. He and I have corresponded for many years, but it is not often I have had an opportunity of seeing him in the flesh. He has set up an observatory in the Isle of Wight, where he sits watching for earthquakes in all parts of the globe, and recording the tremors that affect the ground. I think it is incumbent on geographers to do everything they can to further the institution of similar carefully equipped observatories for the detection and recording of these earth-movements. We can never tell to what practical account the most abstract scientific research may be turned, and I think we can even now see, apart altogether from the scientific results, the practical bearing of some of these observations. I hope the idea will be taken up and developed.

Dr. H. Woodward: I don't think, after we have heard Sir Archibald Geikie, that it would be proper that I should add any remarks, except to congratulate my friend, Professor Milne, on his return to England after twenty years' residence in Japan. When a man has been working steadily in a foreign country for twenty years, he must feel it a great pleasure to come back and meet with a large and appreciative audience like the present one, to take an interest in the work he has been carrying on, when one considers the very small encouragement one receives in a foreign country; and although we have not as many earthquakes to supply him with, yet, if what he has told us to-night is to be relied upon, that he can receive through the Earth, from all parts of the Earth, earth-tremors and indications of earthquakes, and can measure them, it is hardly necessary he should go further away. At the same time I hope, for the peace and safety of our island, as Sir Archibald said, that he will not promote the production of too many earthquakes here. I hope the Society will encourage Professor Milne in every possible way, and help him in setting up proper stations to make observations, and when these are accumulated we may look for most valuable results. Nothing can be more striking than what he has pointed out regarding the rapidity with which earthquake-tremors are transmitted through the centre and different portions of the Earth's interior, because it would seem to point out an enormous density of the Earth's interior as compared with what we had reason to suppose would be the case, and if that is so, it may lead to most important results with regard to a knowledge of the interior of the Earth, which we

can never hope to reach by any other means. I heartily congratulate Professor Milne on his interesting paper.

Professor JOHN PERRY: I am afraid I am not well able to respond to a sudden call like this. Indeed, as Professor Milne hinted in his lecture, I have not anything to say even about the instrument which I invented. I may further say that even in my three and a half years' stay in Japan, I was not able to develop any greater love for earthquakes or for the study of earth-movements than exists in the average inhabitant. But I can admire the enthusiasm, and I can welcome results of the work, of a man like Professor Milne. I confess that I have puzzled very uselessly over that fact so wonderful to the mathematician, that earth-ripples travel sometimes from Japan to Europe at the rate of 12 to 20 kilomètres per second. As a practical engineer, I take it that the most important outcome of Professor Milne's work during twenty years is that he really has discovered how to protect houses from earthquakes. He has not said anything to us about this to-night, but it is a very wonderful thing. To me, living as an engineer in London, the interest in this matter greatly depends upon the possibility of mutual reversibility of the problem and its solution. He isolates a house so that it cannot be affected by motions of the outside earth. Can we employ Milne's method to so isolate an engine that it cannot give motion to the outside earth? I feel sure that we can, and if this is the case, one great trouble will be removed from the minds of electric light engineers. It was in connection with this great trouble that I recently began to study the subject of earth-movement. The instrument which Professor Milne has shown you was hurriedly designed to allow me to make observations of motions in a block of houses built near an electric light station. I have been able to discriminate between up and down, north and south, east and west motions, and to observe their amounts. Professor Milne applies it, I think, to indicate more particularly, changes of inclination. He has assisted me by using one of his horizontal pendulums to make actual records of the motions in my block of houses. I congratulate the members of this Society on hearing such an excellent lecture on the subject of earth-movements from the man who has so specially made it the study of his life, and I hope that he will be successful in establishing his seismic observatories at many places over the world.

The PRESIDENT: It is from Sir Henry Howorth that we must hope for the advocacy of the cause of establishing observatories in England. As there are 928 in Japan, our Government might respond to our request for one here, and we must look to Sir Henry Howorth, one of the scientific members of the House of Commons, to help us in advocating this measure.

Sir HENRY H. HOWORTH: Whatever courage it may require to face these awful earthquakes in Japan, you must attribute to me a considerable amount of courage in daring to get up on the eve of Parliament, to make a suggestion that the money which is wanted for guns and ironclads should be invaded by a claim for observatories to record various methods of earthquake action. You will be pleased to know that, so far as I am concerned, it will be a great delight to press on this kind of expenditure; for, in addition to believing that we cannot spend too much in insuring what we have, I want to make what we have as good as we can, so that we may be at the head of all nations, if possible, in science as well as material prosperity, and not have a rival in our Japanese friends in investigating earthquakes. But I must remind you, sir, I belong to a class not popular in the House of Commons—the independent member, and the independent member is described as "a rascal, whom no party would trust," and therefore all I can do is of very little value and importance. May I refer to one kind of earthquake that happens in England, to which my friend did not refer. We have to welcome here

to-night, not only Mr. Milne himself, but the lady who has shared all these perils with him, and I am pleased to believe that there are certain tremors and earthquakes that occur in a good many houses in this country, even in the houses of members of Parliament, which do not reach Japan at all, and these he will hardly be able to measure by the instruments on the table. I refer to domestic tremors. I believe I have one curious distinction in this room. I was born in the house which was situated in the very middle of where the great chasm took place in Lisbon, in the year 1755, in the corner house of Blackhorse Square, built by the Portuguese king over the spot where the collapse took place. This I have often seen as a boy, for the remains were not removed until three-parts of a century afterwards. One moral that we should draw is this, that we never know when these paroxysmal movements take place, or in what particular quarter. People do not realize that the destruction of the Eastern empire was more by earthquakes, that destroyed nearly every town in Asia Minor, than any other thing in the world, and those earthquakes that came in a great rush in a certain period of Byzantine history, might come, it appears to me, with a rush in any latitude, because we do not know the laws which govern the distribution of these movements. It would be a great gain to us if we could analyze how these forces are moving, and in which direction, for we may ourselves have to face some of these perils presently; but, apart from this there is the greater question which really underlies a great deal of the reasonings in the sciences of geology and terrestrial physics. It is important, as my friend on my left—who has written the most delightful book on the physiography of the Earth I know anywhere, the 'Scenery of Scotland'—has said, that when we study these sciences, the causes of earthquakes and their effects form the very elementary knowledge we must have, if we are to understand these problems. The whole of science is continuous; we know now that all the gases, liquids, and solids are perfectly continuous forms of matter. These waves of motion, which were supposed formerly to be limited to air and water, pass through solid ground as easily as through liquid masses. We shall now be able, because we can apply our tests more easily through solid matter, to test the character and extent and work of this kind of earth-movement. I must ask your indulgence for detaining you so long, but the lecture has been most delightful in every way, and I cannot say how much we all appreciate the difficulty of introducing a little humour into a dry subject, which seismology at first sight seems to be. We hope we may be able to secure one or two at least of these most necessary observatories in this country.

The PRESIDENT: I cannot help recurring to the time, many years ago, when this study of seismology was confined almost entirely to earthquakes. I was looking the other day over one of the addresses of my illustrious predecessor, Sir Roderick Murchison, delivered in 1859, and I found that he referred to the subject of the lecture to which we have been listening this evening. He said that "the theory of earthquakes could only be regarded as a subordinate part of a more general theory which will deal with all earth-movements, great or small, to which the Earth's crust is subject." He looked forward to the time when an attempt would be made to unite into a whole the mass of facts, and to account for them by the application of one consistent theory. Now, I think this shows rare prescience in Sir Roderick. He almost seems to have foretold that we should have such a meeting, and listen to such an address as we have heard this evening, looking forward for a period of thirty-seven years. I think I may assure Professor Milne, on the part of the Council of the Royal Geographical Society, that he will receive all possible help, and that the Council will use all the influence it possesses in order to further the admirable work of establishing these stations in proper places over the globe. It now only remains for us to perform the very

agreeable task of thanking Professor Milne for combining, with amusement and humour, an address which is likely to be an important starting-point in a new direction, and in a new line of investigation, or, at all events, a very great enlargement of a former line of investigation. It is quite clear that, however dull the subject—and seismology is certainly not a dull subject—it would never be dull in the hands of Professor Milne. Now I ask you to return Professor Milne our warmest thanks for the very interesting evening he has given us. Our next meeting is on February 24, when Mr. Littledale will read an account of his recent very interesting journey through Tibet. I cannot help, in anticipation, expressing my admiration of the way in which Mr. Littledale performed his journey. Mr. Scharbau has put into my hands a note, by which I see that, after going over 860 miles by dead reckoning, he was out only half a mile when he came to fix his position by the observation.

APPENDIX.

For the purpose of making the references to the records obtained from seismographs and horizontal pendulums more clear, it has been thought advisable to add the following diagrams.

A. *Records from Seismographs.*

Fig. 1.—This figure shows the vibrations of an earthquake (September 3, 1887) as recorded upon a *stationary* smoked glass plate. From this we see that, although the greatest movements have been in a north-east and south-west direction, movement has taken place in many azimuths. The direction followed by an earth-particle

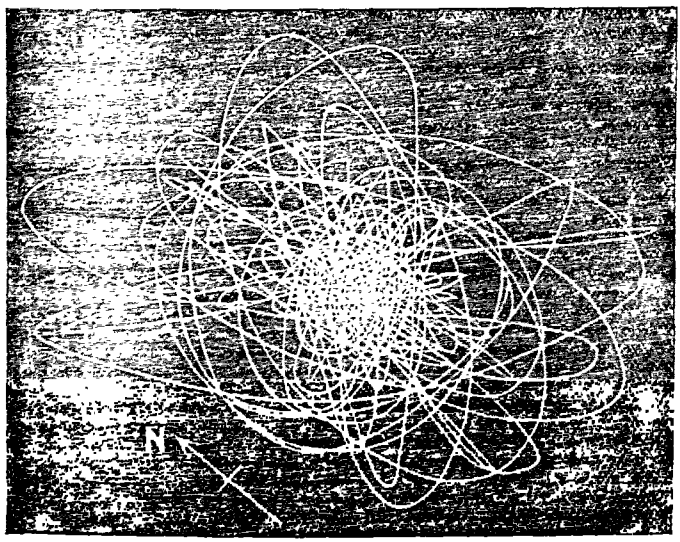


Fig. 1.

has not been in straight lines, but in ellipses and along paths showing a complexity of curves.

Fig. 2.—The diagrams shown in this figure are those of the north-south and the east-west components of an earthquake recorded upon a *moving* smoked glass surface. The vertical component is not shown. A portion of the preliminary

tremors are shown preceding the large vibration or shock of the disturbance, which is followed by irregular vibrations and jolts, which in some earthquakes may continue for several minutes. Small vibrations corresponding in period to the preliminary motions are often superimposed upon the latter portion of a diagram, which usually dies out as long-period smooth undulations. Although this diagram illustrates various types of earthquake motion, it is only occasionally that all occur together. Instead of one shock there may be several shocks, or a movement

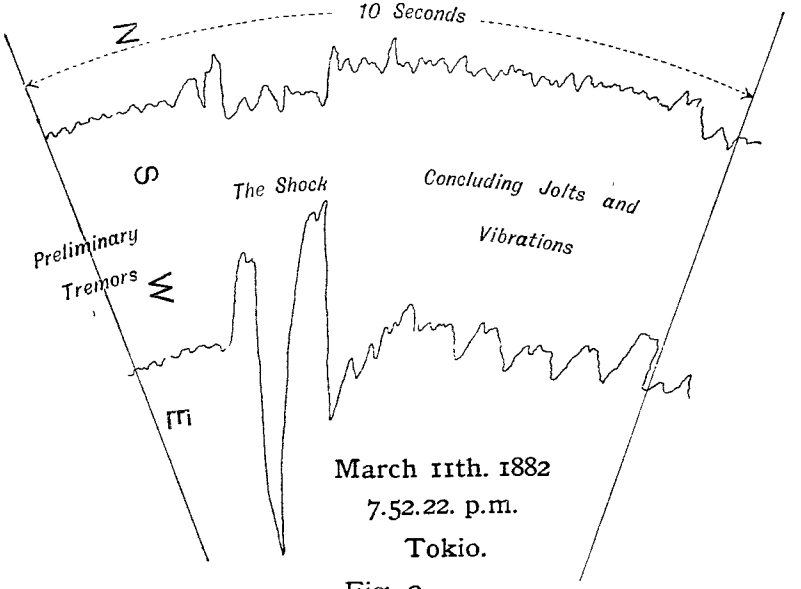


Fig. 2.

consisting only of rapid vibrations or of gentle undulations. The duration of the disturbance as recorded by a free horizontal pendulum may be several hours.

From the open diagrams, it is evident that the amplitude and period of any vibration may be measured, and from these quantities maximum velocities or or accelerations may be calculated.

B. *Horizontal Pendulums intended to record Earthquakes, including those which cannot be felt, Diurnal Waves, Tremors, and other Earth-Movements.*

Fig. 3.—This figure shows the chief features of a horizontal pendulum standing on a masonry column, with the photographic recording apparatus on a table at a lower level, which is an arrangement found to be convenient. The boom of the pendulum, which is about 2 feet 6 inches in length, is held in a horizontal position by a wire tie, which brings the agate pivot at the inner end of the boom against a needle projecting from the base of an iron stand. The weight of the boom, which is made of aluminium, is balanced by two small weights at the extremities of a small bar pivoted between the tie and the stand. The stand has three levelling-screws. The front one of these tilts the boom in a fore and aft direction, thus varying the sensibility of the instrument. Another of these screws has a pointer moving over a scale of degrees. By turning this screw the plane of the stand and boom may be tilted through a known angle. This results in the outer end of the boom being deflected through a certain number of millimetres. The instrument

is usually adjusted so that the period of its swing is about seventeen seconds. When this is done, a movement of the outer end of the boom of one millimetre indicates that the stand has been tilted 0·5″ of arc.

The outer end of the boom carries a small slip of blackened mica, which has a

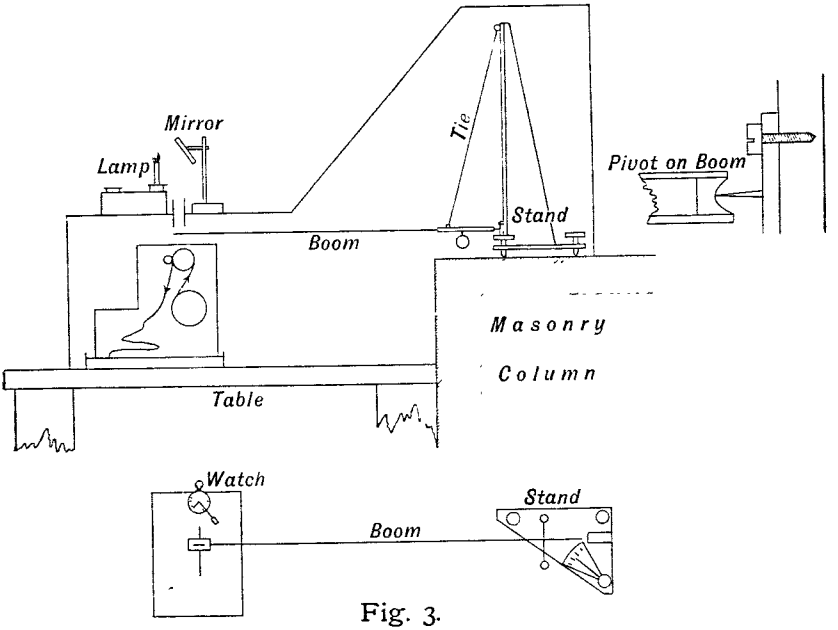


Fig. 3.

slit in it. This floats over a slit in the lid of a box, which is at right angles to the slit in the mica. In the box there is clockwork driving a 2-inch band of bromide paper. The light from a small benzine lamp is reflected by means of a

Fig. 4.

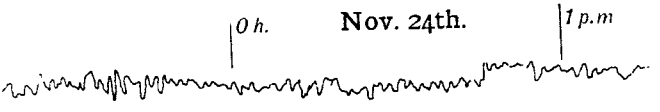


Fig. 5.

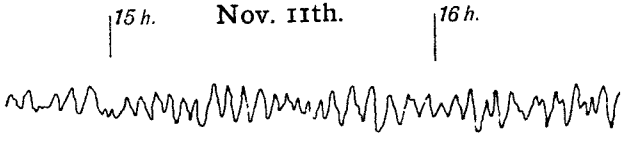


Fig. 6.

mirror downwards through the two slits, and reaches the paper as a point. If the floating plate has a broad slit and a narrow slit, the image on the moving photographic surface is that of a broad line and a fine line (Figs. 4 and 7). The

fine line gives beautiful definition for slow movements, whilst the broad line is visible for rapid motions when sufficient light may not have passed the fine slit to make a photographic impression.

The rate at which the paper moves is controlled by a watch with a long minute-hand tipped with a piece of blackened mica, which every hour eclipses the light entering one end of the slit. These hour-marks, with paper moving at

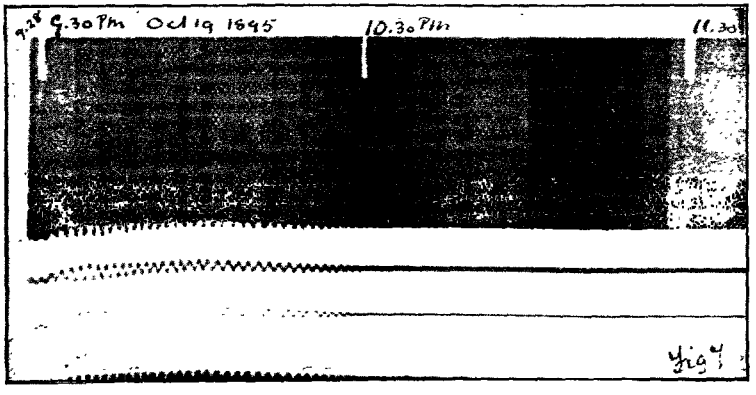


Fig. 7.

about 45 mm. *per hour* (see Fig. 7), enable an observer to determine the time of any movements to within ten seconds. For studying diurnal waves and the times when tremors are frequent, paper moving at the rate of 75 mm. *per day* is sufficient.

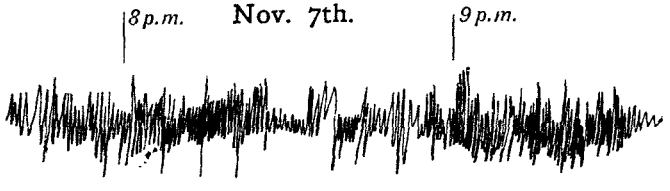


Fig. 8.

With the writer's installation at Shide, in the Isle of Wight, every morning the watch is wound, and the lamp attended to; whilst once a week a new 25-foot roll of bromide is put into the clock-box. The attention which the instrument

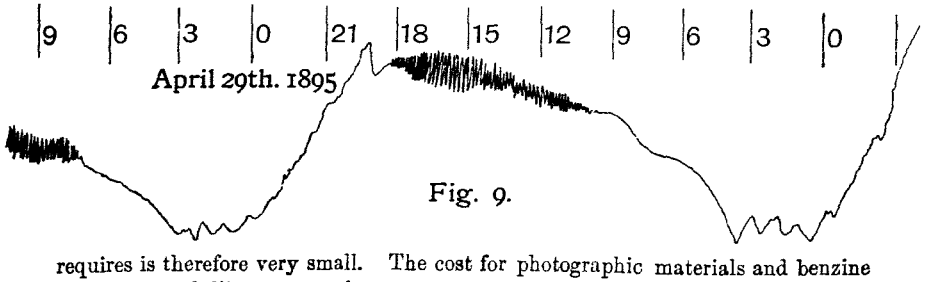


Fig. 9.

requires is therefore very small. The cost for photographic materials and benzine is about two shillings per week.

Fig. 5.—Shows small long-period irregular tremors.

Fig. 6.—Shows large long-period irregular tremors.

Fig. 7.—Shows tremors with great regularity in period and amplitude. This is a photographic reproduction of the photographic record.

Fig. 8.—Shows rapidly recurring tremors, which sometimes continue for several days.

Fig. 9.—Shows a daily wave, with tremors between 9 p.m. and 6 a.m. (18 hours). These waves may be larger or smaller in amplitude, and have a smooth outline.

Fig. 10.—This shows an earthquake recorded in Japan, which had its origin *near to the antipodes* of that country in the Argentine Republic on October 27,

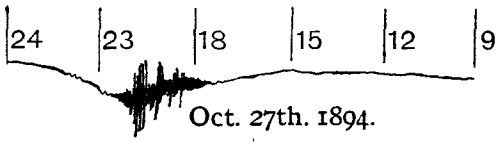


Fig. 10.

1894. The duration of the motion in Japan was about three hours. Other unfelt earthquakes have had durations exceeding five hours, and their amplitude has been much greater than the one here shown.

In addition to these examples of the movements of horizontal pendulums, observers will find many others of an extremely curious nature. Further information respecting these instruments can be obtained from Mr. R. W. Munro, Granville Place, King's Cross Road, London, W.C.

THE MOVEMENTS OF THE SURFACE WATERS OF THE NORTH SEA.*

By H. N. DICKSON, F.R.S.E.

It has probably never been doubted that we are far from having an adequate knowledge of the circulation of waters in the North Sea and the various channels connecting it with the North Atlantic, but the brilliant researches of the Swedish oceanographers, Ekman and Pettersson, have recently thrown our deficiencies in this respect into very striking relief. It has been shown that a complete discussion of the conditions obtaining in the Baltic is impossible until the incoming and outgoing currents are traced to their origins and endings; and that for this purpose isolated expeditions like those of the *Pomerania*, the *Drache*, or the earlier cruises of the *Jackal*, while they afford valuable information, must always fall short, on account of the rapid changes constantly occurring in different parts of the area. What is wanted is, as it were, a series of instantaneous photographs recording the distribution of temperature and salinity in the whole body of water between the Færoe Islands and the Gulf of Bothnia, and between the Norwegian Sea and the English Channel; and that not only in different seasons of

* Report on Part of the Work of the International Survey of that Area during 1893-94. By H. N. Dickson, F.R.S.E. Maps (plates), p. 344.

one year, but in successive years. The network of almost simultaneous observations which alone can make it possible to draw such synoptic charts, involves the combined operation of a larger number of ships than any one government can reasonably be expected to send to sea at one time; but the evidence brought out by the Swedish researches, amounting almost to actual proof that increased physical knowledge must lead to increased acquaintance with the habits and migrations of some of our food fishes, opens a way towards an international scheme of observations in which all the countries interested in the fisheries of the North Sea and the Baltic may take part, each exploring the areas more immediately concerning it, and at the same time contributing observations to the general fund.

Professor Pettersson and Dr. G. Ekman submitted a proposal for systematic co-operation to the Congress of Scandinavian scientists in Copenhagen in 1892, suggesting that a preliminary series of such surveys should be made in May, August, and November, 1893, and in February and May, 1894. The results were, under the circumstances, fairly satisfactory. In May, 1893, Danish and Swedish ships were at work, and in August these were joined by ships from the Kiel Commission and the Fishery Board for Scotland, while Norway took part in some of the later terminal cruises. Work was unfortunately greatly hindered during the winter months by weather of quite exceptional severity, H.M.S. *Jackal* being peculiarly unlucky in this respect; but a very considerable amount of material was nevertheless collected upon each occasion. Special reports upon the work done have already been published by the directors of the Swedish, German, and British expeditions—Professor Pettersson, Professor Krümmel, and the present writer—and it is here proposed to summarize the joint results of all the observations, in so far as they refer to the *surface* waters of the North Sea and the entrance to the Skagerak. In discussing the relation of these results to the currents of the North Atlantic and Norwegian Sea, I have collected all the available observations made on board merchant vessels within the periods named. Professor Pettersson was kind enough to work up the records of Danish and Swedish vessels, and to send me the results, and with these I have incorporated observations extracted from logs deposited in the Meteorological Office, to which Mr. R. H. Scott, F.R.S., courteously gave me access. I may here be permitted to express my thanks to my colleagues for entrusting to me this part of the work, and for the cordial way in which they have rendered every assistance in carrying it out. I have specially to thank Professor Pettersson for many hints and suggestions.

In considering the circulation of waters in the North Sea, we have to deal with the various sources from which these waters are derived, the relative amounts obtained from each, and the distribution and mixture of the different waters over the North Sea itself. The inflowing waters are in the main of two kinds—oceanic waters entering from the

north and west, and also to some extent from the Straits of Dover, and land waters entering from the Baltic and from various rivers; and the chief characteristics upon which we have to rely in identifying these are salinity and temperature. The oceanic water in its pure state always contains more than 35 parts by weight of salt in 1000, while the land waters under similar circumstances never rise above 34 parts per 1000: the range of temperature is in the former case much less than in the latter, the supply of fresher waters being to a large extent cut off by frost in winter, and rising in summer to a temperature much higher than is observed in the open sea. Between 34 and 35 per mille of salinity is found a water intermediate in its properties between the two just mentioned, and in nearly all cases formed from them by mixing. To this mixture has been given the name "North Sea water," although, as will be seen later, the actual mixture does not always occur within the North Sea itself. In a large and deep basin the amount of this intermediate water present at any time would be small compared with either of the others, for the fresh water would overlie the denser, and mixture would take place slowly; but in a shallow area like the North Sea, where the influences of wind and tide penetrate to the bottom, mixture sometimes takes place with amazing vigour and rapidity, so that the intermediate water sometimes occupies almost the entire basin.

In reviewing the distribution of temperature and salinity in the North Sea during the periods over which our observations extend, we are accordingly led to consider local influences which affect the mode and extent of mixture taking place, after which we may proceed to discuss the external influences regulating the supplies. These influences we may take to be, on the one hand, differences of specific gravity, themselves due to the variations of temperature and salinity; and on the other, the prevailing atmospheric conditions, the latter, in the case of surface waters under consideration, much more important than the former. The sketch-maps (Figs. 1 to 5), which are intended to accompany the charts of the salinity (Plates 1 to 5) and of the temperature (Plates 6 to 10) of the surface of the North Sea, need no further justification. They have been prepared from data extracted from the Daily Weather Reports published by the Meteorological Office, *i.e.* from land observations only; the average distribution of atmospheric pressure at 8 a.m.—from which the direction and force of the prevailing winds are inferred—is shown by solid lines, and the air-temperature by broken lines. Similar charts have been prepared for periods preceding those covered by the salinity charts (Plates 1 to 5); these are not reproduced, but any points of interest brought out by them are included in the following notes:—

Surface of the North Sea.

May 1 *to* 10, 1893.—(Plate 1.) Oceanic water covers a very small

area well to the north and north-east, and an isolated patch near the Straits of Dover. Water of 34 per mille salinity covers nearly the whole area, and extends to the west coast of Scotland. The fresher waters are restricted to a narrow strip on the eastern side. Temperature (Plate 6) tends to be highest near the coasts, but the isothermals run, in general, parallel to the lines of latitude, temperature rising to southward, but nevertheless highest in the open sea to north-west. The characteristic feature of this chart is, however, the remarkable uniformity in the distribution of temperature in and around the North Sea area, and this fact attains great significance from a consideration of the distribution of

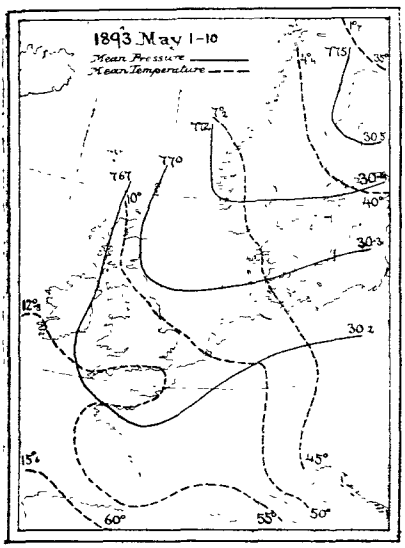


FIG. 1.

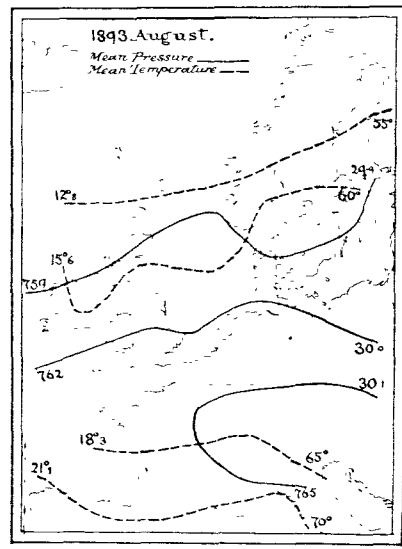


FIG. 2.

pressure. During the last ten days of April, a shallow anticyclone lay over the North Sea, and moderate anticyclonic winds from north-east continued during the whole period covered by the charts (Fig. 1). So far as the movements of the surface water are concerned, the conditions are probably those normally assumed when both oceanic and land streams are weak.

August, 1893; *the whole month.*—Plate 2 shows oceanic water covering a much larger area than in the preceding case, the axis of this area being also more central, while there is a marked influx from the Channel. Water of 34 per mille salinity is now a good deal restricted; the bulk of it lies in the south part of the North Sea and along the east coast of Great Britain. Fresher waters cover a greatly increased area, an immense volume of water of extremely low salinity now issuing from the Baltic at a temperature higher than is observed anywhere except in two isolated patches near the British coasts. Temperature gradients

are on the whole much steeper, the isothermals being generally tilted towards the continent, but tending to curve round an axis running north-westward between the Orkney and Shetland islands, obviously the effect of the strong tidal streams (see 'Report of the Fishery Board for Scotland,' 1894, p. 354).

The barometer charts show that in the latter part of July pressure was lowest over Southern Norway, giving fairly light gradients for westerly and north-westerly winds. During August the centre shifted westwards towards the Norwegian Sea, and then returned—on account of the passage of shallow depressions—giving south-westerly winds in the early part of the month, and then again westerly. The mean for the whole month (Fig. 2) gives light gradients for westerly winds, closely agreeing with the many-year average for August ('*Challenger* Reports,' *Ocean Circulation*).

In studying these maps, it is to be borne in mind that alike in Scandinavia and in the eastern parts of Great Britain August is a month of great local disturbances of temperature and rainfall, some of the eastern counties of England receiving their greatest monthly rainfall at that time. It would seem that in 1893 the wind influences over the North Sea were nearly normal, both the oceanic and continental inflowing streams being probably abnormally strong.

November 16 *to* 25.—Plate 3 shows 35 per mille water forming a blunt-ended tongue which extends over the greater part of the northern entrance to the North Sea; and the same water is intruded for a considerable distance from the Straits of Dover. The intermediate 34 to 35 per mille water occupies nearly all the rest of the area, except off the Norwegian coast, where the periodic influx of "bank water" from the Norwegian channel, first recognized by Ekman and Pettersson in 1890 (*Scottish Geographical Magazine*, 1894, p. 456), is again observed. Professor Pettersson informs me that the deep-sea observations of the Norwegian and Swedish expeditions, under the direction of Dr. Hjorth and himself, afford final and conclusive proof of this remarkable phenomenon. It is further noticeable that the supply of nearly fresh water from the Baltic is now wholly cut off.

The temperature of the surface water (Plate 8) is now lowest on the continental side, except off the east coast of Scotland, where the occurrence of up-welling under the conditions observed has been proved (*Journal of the Scottish Meteorological Society*, vol. viii. p. 332). There is a marked maximum at the entrance to the Skagerak.

The isobaric chart for the ten days preceding November 16 shows a strong minimum near the Færoe islands, the centre of which moved later (Fig. 3) to Northern Scandinavia, giving gradients for strong westerly and north-westerly winds. The period was marked by a succession of deep cyclones moving eastwards and north-eastwards, and included the great storm which travelled from south-west as far

as the Shetlands, and then recurved southwards along our eastern coasts.

In this case local and oceanic influences were probably more energetic than usual, and the result is shown by the sharp contrasts.

February 19 *to* 28, 1894.—Plate 4 shows that oceanic water of 35 per mille salinity now extends over most of the area, and is continued along the central axis throughout. Water between 34 and 35 per mille forms a narrow strip on each side, and in the north reaches the Norwegian coast. Fresher waters are restricted to a band near the German and Danish coast and to the Skagerak, water below 33 per mille being entirely confined to the last.

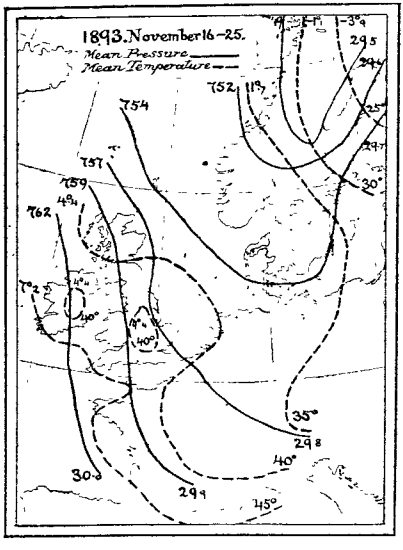


FIG. 3.

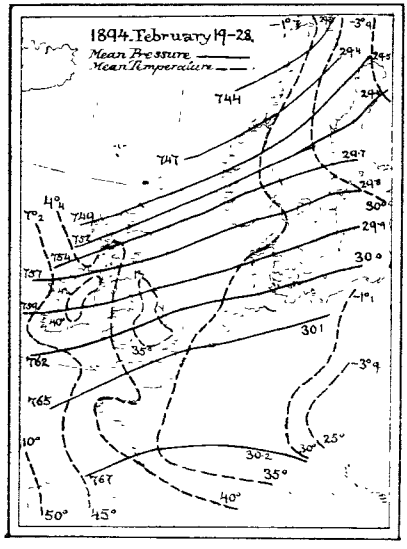


FIG. 4.

The distribution of temperature is altogether changed; the isothermals run north and south, temperature being highest to westward. In the oceanic area beyond, a large area of very uniform temperature is observed to the westward of the British Isles, to the north of which we may suppose, although observations are wanting, that the gradient becomes steep. The distribution gives additional interest to the barometer charts for the days preceding and during (Fig. 4) the period, which show steep gradients for westerly and south-westerly winds. The appearance of the charts would indicate that local and oceanic influences are strongly developed, while the land influence remains weak.

May 1 to 10, 1894.—Data are very incomplete, but it appears from Plate 5 that the 35 per mille water covers practically the same area as in the preceding February. Probably there is some freshening of the water

round the continental coasts, but the relative conditions seem very much to resemble those of February. Temperature shows a tendency to resume the normal east and west distribution, with increased warmth towards the north-west. Barometric pressure (Fig. 5) shows a minimum north of the Shetlands, with fairly steep gradients for westerly winds over the North Sea, tending to north-west near the Orkneys and Shetlands, and south-west on the continental side.

In addition to the charts here reproduced, Professor Pettersson has been able to map the distribution of surface salinity over the greater part of the area at the end of November, 1894, and the middle of February, 1895, from observations to which this country did not contribute. Both cases exhibit some peculiar features. In November, 1894, the 35 per mille water is split into two parts, one extending south-east from the Orkneys, and another off the Norwegian coast, reaching as far south as lat. 59° N. The total area covered by it is but small, by far the greater part of the North Sea surface being occupied by the intermediate 34 per mille water. Very fresh water—below 32 per mille—extends far north along the Norwegian coast, and the 32 per mille to 34 per mille forms only narrow strips. A more complete contrast to the corresponding chart for 1893 could scarcely be imagined; oceanic and bank waters are enormously reduced, while the Baltic stream, instead of being cut off as in 1893, makes its way far to the northward.

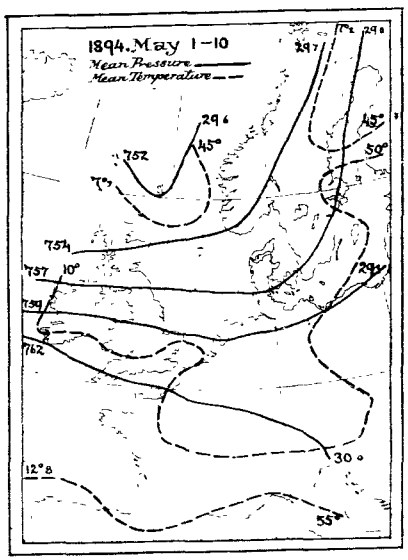


FIG. 5.

The daily weather charts show that anticyclonic weather persisted during most of the month from the Continent nearly across to Great Britain, while deep depressions moved north-eastwards, but kept well out in the Atlantic. This may account for the great weakness of the oceanic streams, including the "bank water;" and the greater strength of the Baltic stream is probably due to the mildness of the season.

In February, 1895, the 35 per mille water again formed a blunt-ended tongue, somewhat as in November, 1893, but it is remarkable for its westerly position, this being the only case where the 35 per mille touches the east coast of Scotland. Water below 32 per mille salinity has disappeared from the Norwegian coast. The daily weather charts show that a centre of high pressure was nearly stationary during the whole period over Scandinavia, while depressions moved northwards to the

west of the British Isles. Hence strong north-easterly winds were experienced over the North Sea, westerly winds outside, and low temperature generally. The oceanic stream is therefore probably strong, but there is a tendency to cover it over at the surface with "bank water," of which the supply is, however, deficient. The cold has entirely cut off the supply of fresh waters from the Baltic.

Comparing the three existing charts of salinity for February, 1890 (see *Scot. Geog. Mag.*, 1894, plate iii. p. 392), 1894, and 1895, we find in each case a central area of 35 per mille water at a temperature of 6° to 7° C., surrounded by colder and fresher waters—North Sea water, temperature 4° to 5° C.; bank water, 3° to 4° C.; and coast waters, 0° to 2° C. In 1894 the strong influx of oceanic water both from the north-west and from the Channel caused it to occupy an unusually large area, and temperatures were everywhere high. February, 1895, on the other hand, is characterized by a much smaller area of oceanic water, and large quantities of remarkably cold, fresh waters in the southern part of the North Sea. We remark that 1894 was the warmest, and 1895 the coldest, of the three winters.

We gather from the foregoing that the distribution of water of all salinities over the surface of the North Sea varies within very wide limits, both as to the size and position of the areas covered, and it may be altogether different at the same season in different years, and practically the same at quite different seasons in the same year. Hence it appears that the forces which produce the changes act rapidly; a change of distribution at the surface may be wholly or chiefly due to forces which have come into action only a short time before. A study and comparison of the maps confirms our division of these forces into *local* and *external*, and shows that the chief influence at work locally is the wind. It will be seen later that the wind has also a profound effect on the surface supplies of oceanic water, a fact which greatly increases the difficulty of separating out the results of local action in mixing the inflowing waters. In so far as existing observations enable us to surmount these difficulties, however, it may be suggested that—

1. Calm weather favours the spread of a thin layer of water of 34 per mille salinity over a great part of the surface of the North Sea, the result of previous mixing.

2. Strong northerly (N.E., N., or N.W.) winds tend to broaden the area covered by 35 per mille (oceanic) water, and to blunt its extremity, and the surface salinity on the whole is increased, the fresher outflowing waters being driven back. One very important effect is to send water between 33 and 34 per mille southwards along the west coast of Norway; and further investigation may show that these conditions are responsible for the influx of "bank water" into the Skagerak already referred to, which has been found to coincide with the period of the Swedish herring fishing.

3. Westerly and south-westerly winds tend to form a continuous strip of 35 per mille water along the whole of the central axis of the North Sea, probably because the oceanic streams are strengthened, but at the same time mixing goes on rapidly, and there is strong upwelling from the British coasts.

4. Easterly and south-easterly winds reduce the salinity as a whole by spreading the fresher waters over the surface. The oceanic water is covered over, or shows a small area close to the coast of Scotland.

It would, of course, be premature, at this stage of the investigation, to insist on the invariableness of these results, or to found important conclusions upon them. The actions are in all cases complex, and their reactions are undoubtedly still more so. One point only can hardly pass unnoticed, and may be suggested as lending additional interest and importance to further inquiry—the indication that during the colder seasons the presence of a large body of warm oceanic water in the North Sea constitutes a line of weakness at the edge of the great continental system of high pressure, along which cyclones tend to make their way, while a surface of fresher, colder water favours the extension of high pressure over the British Isles. A comparison of the winters 1893–94 and 1894–95, in relation to the surface temperature and salinity of the North Sea, brings forward a number of questions of this nature which press for early settlement one way or another.

The Inflowing Waters.

Turning now to the external influences controlling the volumes and velocities of the inflowing streams, it is evident that these must be considered in two divisions—the fresh or land waters, and the oceanic waters. With regard to the former, it may be said that the chief supplies come from the Baltic, while the British contributions are of small importance. The currents of the Baltic and Skagerak have been discussed by the Swedish hydrographers with a completeness which stands unrivalled in work of this kind, and we need, therefore, only again refer to Professor Pettersson's papers in the *Scottish Geographical Magazine* for 1894. For our present purpose it is to be remembered, in particular, that the supplies of these waters are much greater in summer and autumn than in winter and spring, the difference being in general greatest between a hard winter and a wet summer, and least between a mild winter and a dry, hot summer; that these waters are much the hottest in summer and the coldest in winter, and that therefore their relative lightness is greatest in the former season; that, as outflowing currents, they tend to split into two whenever from any cause their direction is altered, and that they tend to induce "reaction currents" of inflowing water under them.

The most important fact in connection with the supply of oceanic water to the North Sea is, that in the Færoe-Shetland channel, just

at the north-western edge of the continental shelf, a mixture of waters from different sources is constantly taking place. The current of Atlantic water pouring over the Wyville Thomson ridge sucks up the cold bottom water of the Norwegian Sea, and, mixing with it, has its own temperature lowered, thereby causing it to sink and in great part lose its horizontal motion. It is absolutely essential that we should possess a detailed knowledge of how this process goes on from year to year, of the various sources from which the waters are derived, and of the proportions in which they enter into the mixture. Much information is to be derived from the work of the *Porcupine*, *Lightning*, *Triton*, and *Jackal* expeditions, and from the Norwegian North Atlantic expedition, but a great deal remains to be discovered, and for this deep-sea observations alone will suffice. It will appear presently, however, that surface observations are of very considerable value.

We have to consider (*a*) the movements of the great north-easterly drift of warm surface water from the Atlantic, and (*b*) obscure and variable currents from northern latitudes. The maps of surface temperature for dates corresponding to the charts of the North Sea (Plates 6 to 10) present the following features:—

May, 1893 (Plate 6).—An axis of high temperature runs from mid-Atlantic north-eastwards to about 15° west longitude in the latitude of Ireland. It then splits into three branches: one runs up to the Færoe-Shetland channel, the warm stream being very narrow; a second runs due north to the south-east coast of Iceland, where it is blocked; and a third in a north-westerly direction to the west coast of Iceland, where it spreads out and is lost. A centre of cold to the east of Iceland extends south-eastwards, and there are signs of another such centre to the east of Greenland.

August, 1893 (Plate 7).—The warm axis in the Atlantic has moved about 6° to the westward. It splits into three as before, but the Færoe-Shetland stream has become still narrower, the east-Iceland stream has considerably diminished, and that to the west of Iceland has also narrowed, especially towards the south. Two well-marked cold axes are now apparent, one stretching from the east of Iceland to the Færoes, and a second coming down the east coast of Greenland and beyond Cape Farewell. It is to be noted that the warm axis which appeared off the western coast of Greenland in May is no longer to be found, having probably moved westwards.

November, 1893 (Plate 8).—The Atlantic warm axis has moved still further west, but it now bends more rapidly to the north-east. The data are insufficient to show the subdivisions completely, but it is noticeable that the north-easterly stream seems wider, and that the stream to the east of Iceland is almost absent. The observations indicate a well-marked cold axis from the east of Iceland, but this now runs due south, allowing greater expansion of the warm stream in the Færoe-Shetland channel.

February, 1894 (Plate 9).—The Atlantic axis has again moved eastward, and, so far as the observations go, there seems to be a wide stream entering the Færoe-Shetland channel.

May, 1894 (Plate 10).—The Atlantic axis lies far to the westward; the north-easterly stream is probably weak, but is narrowed and confined by the cold stream from the east of Iceland. The cold stream to the east of Greenland, and the absence of warm surface water to the west of Greenland, are again noticeable.

From these maps it would seem that the Atlantic streams are on the whole strongest in summer, but that their common source is at that season far to the west. The currents flowing northward may then be weakened by an unusually large delivery towards the Spanish and African coasts (the "west wind drift" and "Canaries current"); but the great branchings of the north-east stream are nevertheless more clearly marked than in winter, and we may connect this with the fact that the cold streams moving southwards from the eastern coasts of Iceland and Greenland are also most strongly marked in summer. In winter these streams are weak or altogether absent, and the warm north-easterly drift tends to spread itself uniformly over the surface of the Norwegian Sea.

At the same time there is evidence that the whole distribution varies greatly from year to year. The charts of mean surface temperature between Davis Strait, Iceland, the Færoes, and Scotland, recently published by the Danish Meteorological Institute, give monthly averages for the warmer seasons, and, so far as it is possible to compare these with the charts accompanying this paper, it seems that the average conditions are of much the same type as those we have described, except that the contrasts between the different streams are less clearly marked. In some years the state of affairs may be altogether different, but there remains little doubt of the immense importance of the effects of the polar currents at certain seasons in modifying the warm drifts from the Atlantic. The problem, indeed, resolves itself into one very similar to that already stated for the North Sea—an analysis of the external and local influences acting in the region between the Færoe and Shetland islands. The former are now (*a*) variations in the Atlantic stream, and (*b*) variations in the polar streams; and the latter the action of the winds in mixing the waters derived from these two sources, and in driving the mixture into the North Sea.

The polar streams are evidently greatly diminished in volume during winter and increased in summer, to an amount depending chiefly on the extremes of temperature in each case in different years. The strength of the Atlantic streams and the conditions of mixture depend partly on temperature, but chiefly on the intensity of wind action, and with this in view it may be worth while to glance at the changes in the distribution of atmospheric pressure controlling the

prevailing winds from month to month. The question is one of the varying relations between the "Atlantic anticyclone" and a belt of low pressure, really an immense cyclone track, which extends from the south-east of Greenland, round Iceland, and thence in a north-easterly direction. The Atlantic anticyclone is weakest in winter, consisting in January of a long belt of high pressure with two centres; the eastern centre increases in intensity and moves westward, attaining its maximum in mid-Atlantic in July, and thereafter extending east and west and diminishing. Hence what we may call the *propelled* surface currents are strongest in summer, but the north-easterly branches may be weakened by the greater area of north-westerly winds towards Spain and Western Africa. Towards autumn the source of these streams would move to the westward, as we have seen it did in 1893.

The *induced* streams, under which we include the continuation of the warm north-easterly drifts, the polar currents, and the mixed waters resulting from their meeting, are chiefly controlled at the surface by the Iceland depression and by the distribution of pressure over Western Europe. The low-pressure belt is most strongly marked in winter, and at the same season pressure is high over the Continent, air tending to flow outwards from the latter towards the former. In summer, on the other hand, pressure over Europe is diminished, and the Iceland depression greatly lessened in intensity. Hence we might expect Atlantic water to be most widely spread over the surface of the Norwegian Sea in winter, but that at that season it would be most difficult for it to gain admission to the North Sea. As the season progressed, the surface-water of the Norwegian Sea would be likely to contain an increasing proportion of water coming from the north by the east of Iceland, and it would become easier for the mixture to enter the North Sea at its eastern side, where it would be covered over by the outflowing Baltic waters. The changes in the prevailing winds seem also to account, in part, for the presence during summer of large bodies of the mixed waters, extending to a considerable depth near the north-western corner of the continental shelf, at the entrance to the Færoe-Shetland channel. I have elsewhere (Report of the Fishery Board for Scotland, 1894) discussed how these waters may find their way into the western part of the North Sea.

The great differences observed over the Norwegian Sea in different years point to a possible explanation of climatic phenomena similar to that hinted at on a smaller scale in the North Sea, inasmuch as a great influx of cold water from high latitudes—the result of exceptional warmth in the far north—must tend to keep atmospheric pressure above the average, while a wide distribution of warm drift water from the Atlantic must favour the development of the Iceland depression or its constituent cyclones.

Arrangements have been made by the Swedish and Norwegian

Governments for monthly expeditions during 1896, which will make deep-sea observations in the North Sea. Through the courtesy of the British Meteorological Office, the Danish Meteorological Institute, the United States Hydrographic Department, the Bureau Central Meteorologique de France, and the captains of a number of private vessels, the present writer is collecting material which it is hoped will be sufficient to allow of the construction of monthly charts showing the distribution of temperature and salinity over the whole of the Atlantic north of 40° N. lat. during the two years 1896–97. The combined investigations will undoubtedly do much to clear up many of the questions suggested by the preliminary work during 1893–94; but it is equally certain that they cannot attain to their full value, nor can the matter be finally set at rest, unless deep-sea observations are made simultaneously in the Færoe-Shetland channel, and at the north-western entrances to the North Sea.

THE GUINEA AND EQUATORIAL CURRENTS.*

By J. Y. BUCHANAN, F.R.S.

THIS is an atlas compiled at the Royal Meteorological Institute of the Netherlands from 2900 logs of Dutch ships, and it gives, besides the currents, the wind, rain, temperatures of the air and the sea surface, and some other less important details. The results are given for each month of the year, and the area included lies between the parallels of 2° N. and 24° N., and the meridians of 2° W. and 29° W. From the grouping of the observations, it is obvious that the great majority of the ships whose logs have been used have been bound round the Cape of Good Hope. The observations are most numerous in the squares from 400 to 500 miles from the African coast, where the conditions are subject to much less rapid and violent change than in the immediate neighbourhood of the shore. This, however, is unavoidable where the logs of ships making ocean voyages are the source from which the data are taken.

The currents logged and entered on the charts are obtained by the time-honoured plan of measuring the distance and bearing of the position of the ship by astronomical observation from that given by dead reckoning. The value of the observations so obtained depends mainly on two particulars—the kind of ship on which they have been made, and the skill of the officer who makes them. The logs used have no doubt been selected after careful criticism of the way in which they have been kept, and elimination of those not reaching the required standard. No information is given as to the character of the ships,

* 'De Guinea en Equatorial Stroomen.' Utrecht, 1895.

whether sailing or steamer, but it is probable that there would be a fair proportion of sailing vessels among them, and the steamers would be vessels of moderate speed. Well-kept logs of sailing ships often give very valuable results, especially in equatorial regions, where the winds are for the most part light, and where calms are frequent. It is then that the current drift enters as a large proportion of the day's reckoning, and can be taken out of it with certainty. In the case of steamers, even of very moderate speed, the ground is got over so quickly that the current has very little time to act, and the effect produced is a very small portion of the day's reckoning, and is liable to considerable uncertainty. It is a fact, not generally recognized, that ocean currents, and especially the equatorial ones, which are the most important of all, generally run in streaks of very moderate breadth in which the water runs with some speed, separated by comparatively slack water. A steamer crosses these streaks in a very short time, and is steaming for the greater part of the day in water having little motion. Sailing vessels, becalmed in a streak, may make quite a good day's run under the influence of the current alone. There is no more interesting physical study than that of the equatorial currents of the great ocean, but to do it at all satisfactorily considerable appliances are necessary, and, for the time being, it must be the principal employment of the ships engaged in it. While, therefore, we cannot attach much importance to the numerical values of the individual current observations recorded in the atlas, they are valuable as affording information on the general direction in which the water was moving in the interval between two observations—that is to say, whether the current was directed towards the east or towards the west. The easterly or counter equatorial current is composed of water of high temperature and low salinity as compared with the westerly running equatorial current beside it, and a great number of important properties of the water and of its inhabitants can be affirmed when the general direction of its motion is known. Information, too, with regard to the wanderings of the currents is valuable, and can be obtained from the charts of this atlas.

There are two sheets for each month. The first is the principal chart of the month, and it gives the current observations in each 1° square. In the centre is the number of days on which observations were made, and the currents observed are represented by arrows radiating in the proper direction from the centre, and marked so as to indicate the velocity in miles per twenty-four hours. In two tables, printed on the blank portion of this chart, are collected in convenient form the numerical details of the observations of current, wind, temperature, etc., so that the influence of one element on another can be followed. The second sheet for the month consists of four charts: I., giving, from the first sheet, the general direction of the current in each square. From

this chart we learn at once whether the current in the particular square has been most frequently an easterly one or a westerly one. Of the other three charts, II. gives the temperature of the sea surface in isothermal lines, III. gives the isotherms of the air, and IV. gives the wind-rose for each 5° square. As before remarked, the squares inshore include much fewer observations than those farther out to sea.

The atlas contains an enormous amount of detailed information in a very accessible form, and it is an important contribution to the literature of oceanography. It is impossible to notice more than one or two points. Nearly in the centre of the area covered by it is Cape Verde. This, like Cape St. Lucas at the extremity of the Californian peninsula and Cape Blanco on the west coast of South America, is the point where equatorial conditions begin in the neighbouring ocean. The same rapid alterations of temperature are found on rounding any one of the three points. North of Cape Verde the water inshore is abnormally cold, and always colder than the air. Here the north-east trade wind blows very steadily, causing a certain removal of surface water towards the south, the place of which is taken most easily by the deeper and therefore colder water of the neighbourhood. South of Cape Verde the easterly running Guinea current pours its highly heated water in towards the shore. On the polar side of Cape Verde there is a general drainage of water away from the shore and towards the sea; on the equatorial side of it there is a general drainage of water from the sea towards the land. The former is an area of emptying, the latter one of filling. The same holds good of points St. Lucas and Blanco on the American continent, which occupy similar positions on the Pacific to that of Cape Verde on the Atlantic; the great Central American bight, with Panama at its head, taking in the Pacific the place of the Gulf of Guinea in the Atlantic. Both seas have a very high general temperature, and both show the same remarkable seasonal fluctuations. The American meteorological atlas of the Pacific shows this very well for the Central American bight, and the Dutch atlas under notice, along with the British meteorological societies' Atlantic atlas, shows it well for the Gulf of Guinea.

The warmest months on the Guinea coast are January and February, the coolest are August and September. The Guinea coast runs east and west in a mean latitude of 5° N. In the month of January the average temperature of the sea surface is 28° C. in the gulf, and it falls if we proceed westward along the parallel of 5° N. to 26·6° in the westmost square of the chart. At this season the current is running very strong to the eastward close along the shore. Besides having a high temperature, the water has a low salinity. Further out to sea in this season the easterly moving water is confined within narrow limits, from 4° to 6° N. lat. In August and September the current still runs strong inshore, but the area over which an easterly set is experienced out at sea extends northward almost to the Cape Verde islands. At this

season the temperature of the surface water in the gulf is as low as 24° C., and rises to nearly 27° C. as we proceed westward. The water of the inshore current at this season has a much greater salinity than the warmer water of January, and there is reason to suspect that the easterly running inshore water of this season is a continuation of the strong easterly under current observed and measured in the *Buccaneer* in March, 1886. During the laying of the submarine cable from Fernando Noronha to Senegal this under current was observed far to the westward, and there is every reason to believe that it is a constant and important factor of oceanic circulation, the heart of which lies in the equatorial belt. It will be seen that we are but very imperfectly acquainted with the facts of the circulation of the equatorial waters. They can only be ascertained by special investigations, for which the opportunities are rare. Until some progress has been made in this direction, theories, accounting for the circulation of the water under the action of winds at a great distance, or otherwise, are apt to be misleading. All facts carefully observed are valuable, and the atlas under notice contains a great mass of them. It adds one more to the many important contributions of the Dutch to oceanography and marine meteorology.

RECENT AFRICAN BOOKS.

By EDWARD HEAWOOD, M.A.

THE stream of African literature continues to flow in unabated volume, and the record of the past year includes a number of works, each of which but a few years back would have seemed worthy of exceptional notice, but to which we can now merely refer in a general summary. Moreover, as some account of all the journeys has already appeared in the *Journal*, it will be unnecessary to describe afresh the routes followed. The illustrations, too, are so generally good and abundant that they need not be referred to in each individual case.

Colonel Monteil's volume * is produced in a style that well befits the importance of his great journey from the Senegal to Tripoli. Written during a limited absence from the scene of his exploits, it is of necessity limited mainly to a vivid personal narrative of the various episodes of the journey, the scientific matter being reserved for future treatment. More solid matter is, however, by no means lacking, for a valuable light is thrown on recent political developments within the extensive region traversed, for much of which we had no more recent information than that given by Barth and Nachtigal. Of much interest, *e.g.*, are the notes on the state of Mossi within the bend of the Niger, which, in the writer's

* 'De Saint-Louis à Tripoli par le Lac Tchad.' Par le Lieut.-Colonel P. L. Monteil. Paris: Félix Alcan. [1895].

opinion, is unique in possessing an ancient negro civilization, which has emerged from the barbarism elsewhere attaching to negro institutions. He also discusses various questions arising from the juxtaposition of fetishism and Islam, which latter has, he says, gained as yet little footing west of the eastern frontier of Mossi. He seems to have a high opinion of the military organization of the Central Sudan states, though in Bornu he saw many signs of decadence, and was able to presage to some extent the danger to which it was then exposed from the ambition of the adventurer Rabah. The commercial capital of the Sudan is said to be undoubtedly Kano.

Besides throwing new light on the hydrography of the southern tributaries of the Niger, Colonel Monteil makes some interesting remarks on the "dalhols," or swampy longitudinal depressions, with sharply defined lateral margins, which occur east of that river, and which he ascribes to the sudden outflow of the ancient Saharan sea—an opinion, however, which is not likely to be accepted without fuller investigation.

The author's belief in the possibility of traversing Africa with a very small armed escort, and also in the effect of decision and rapidity of execution in dealings with Africans, certainly seems to have been justified by the result in his case.

In M. Maistre's book* we naturally find more than in Colonel Monteil's of positive geographical discovery, corresponding to the larger extent of unexplored country traversed. Although the watershed between the Congo and Lake Chad had been already crossed both by Crampel and Dybowski, it is to M. Maistre that we owe the first clear definition of the various streams † which combine to form the Shari, for which again Barth and Nachtigal were our only previous sources of information. In addition to the details given in the course of the narrative, the concluding chapter gives a useful summary of the geography of the region between the Mobangi and Adamawa, a region of special interest as forming the transition-ground both from the equatorial forest to the more open country further north (itself comprising various zones), and from the domain of paganism to that of Islam. The lines of low hills which divide the basins of the Congo and Shari have, we are told, a general west-south-west and east-north-east direction, and appear to connect with an important orographical centre formed by the Bolo mountains. A noteworthy feature of the Shari basin is the prevalence of swamps with an impermeable subsoil of swamp-ore similar to that noticed by Schweinfurth. Much information is given as to the various

* 'A travers l'Afrique Centrale, du Congo ou Niger.' C. Maistre. Paris: Hachette. 1895.

† The three principal head-streams are said to be the Gribingi (unfordable at all seasons, and causing wide inundations during the rains), the Ba Mingi, and Bahar Sara The last, which comes from the south, not the south-east, is identified with Nachtigal's Bahr Kuti, though it would seem more natural to connect this with the town of El Kuti reached by Crampel.

tribes of the country, such as the war-like Manjias, and the finely formed Saras of the south of Bagirmi (already mentioned by Nachtigal). The relations of the Moslems with their pagan neighbours are also discussed, the author agreeing with Colonel Monteil that the former are much more easy to deal with than the latter.

The want of a good general map embracing the whole region is perhaps hardly made up for by the extensive series of sectional maps on which the route is laid down, useful as these will be as a basis for the mapping of this part of Africa.

In this connection it may be mentioned that the scientific results of M. Mizon's journey from the Benue to the Congo in 1890–93, are now in course of publication in the *Bulletin* of the Paris Geographical Society. The first part appears in No. 3 of 1895, and also separately as a reprint. The route is laid down in a similar series of maps to those of M. Maistre, though on a slightly smaller scale. In the accompanying text the nature of the observations on which the positions depend is stated, the various itineraries being also described in detail. An introductory statement is made of the work accomplished in other directions (meteorology, natural history, ethnology, etc.), further details of which are presumably to be given in a subsequent part.

The work* in which Dr. Passarge records the results of the German Expedition of 1893–94 to Adamawa contains an unusually large proportion of scientific matter, and must long remain a valuable authority on the region with which it deals. The extent and variety of information brought home may be ascribed in great measure to the division of labour between the leaders of the expedition, which left Dr. Passarge free to devote his whole attention to the scientific work,† while the fact (partly due, it is true, to the frustration of the original plan) that the routes traversed the country in a variety of directions instead of following a single line, was also favourable to the acquisition of an extensive knowledge of the country.

That full use was made of the opportunities for observation is evident from Dr. Passarge's volume. It is divided into two parts, the first containing the narrative of the journey, combined with valuable details on the various tribes met with, their manners and customs, political and commercial relations, as well as on the geology and physical features of the country; whilst the second gives a connected view of the Central Sudan in its several aspects, the author considering the north and centre of Adamawa to belong essentially to this, but the southern section, on the central plateau, to a geographically distinct region. Positions were determined by means of astronomical observa-

* 'Adamawa.' Von Dr. Siegfried Passarge. Berlin: Dietrich Reimer, 1895.

† He records, however, the important share contributed to this by Baron von Uechtritz, who was prevented by ill-health from writing the record of the expedition.

tions with the theodolite, that of Yola being fixed with much care. The surveys are embodied in a large-scale map in three sections (by Dr. Limpricht), and others show the geological and ethnographical features, and the main routes followed by the Haussa traders.

Few more attractive books of its kind have appeared of late years than that in which Count von Götzen tells the story of his successful march across Africa in 1893–94.* In the first place, the illustrations are particularly well chosen, and give a vivid idea of the various types of scenery met with. But besides this, the author has to tell of an unusually interesting part of Africa. Whilst the first section of the route was by no means devoid of novelty, the interest naturally heightens as we are led to the more remote recesses of the continent, and learn for the first time accurate details concerning a region hitherto almost untouched by outside influence, and possessing such natural features as an active volcanic peak, and a picturesque rock-girt lake of considerable size.† The great central trough here maintains its well-defined character, Lake Kivu lying at the highest point of its floor, and the line of volcanic peaks forming the watershed between the northward and southward drainage within it.

Count von Götzen's further advance through the great equatorial forest is of hardly inferior interest, and in a special way from the light which it throws on much of the information gleaned by Livingstone, during his long detention in the Manyema country, from the Arab traders who were then first making their way north through the forest region inhabited by the Balegga. A section of this tribe ‡ was met with by the German traveller, who found that a route such as that used by Livingstone's informants passed through their district from Nyangwe to Lake Albert Edward. Count von Götzen failed to discover in the forest any of the grandeur attributed to it by Stanley, possibly because all minds are not equally impressed by the attributes of tracklessness and sombreness which certainly seem applicable to it. The picture in the present book of the neighbourhood of a forest clearing is in striking accord with that of Stanley.

* 'Durch Afrika von Ost nach West.' Von G. A. Graf von Götzen. Berlin: Dietrich Reimer, 1895.

† Ruanda, Lake Kivu, and Mount Ufumbiro, the easternmost of the line of peaks which terminates in the still smoking Kirunga, though known by name to Speke, have remained for over thirty years mere names on our maps. The general resemblance between Speke's Lake Kivu and the reality affords one more evidence of that explorer's geographical genius.

‡ The constant recurrence of sections of the Balegga in the forest region between Nyangwe and the Albert Nyanza (accounts of them reached Sir S. Baker in 1864, east of that lake), might almost favour the idea that the name is rather a general designation than a true tribal one. However, they seem to possess a language of their own, which Sir H. H. Johnston (*Proceedings R.G.S.*, 1890, p. 505) says is clearly related to that of Uganda. This tends to confirm their own legends of comparatively recent migrations, which also help to explain their scattered distribution.

The cartographical results of the journey are well shown in a two-sheet map by Dr. Richard Kiepert and Max Moisel.

When, in 1888, Professor Supan reviewed the history of African discovery during the preceding century, he called attention to three principal areas (apart from the Sahara) still unexplored, adding that when these had been intersected by the routes of travellers, then at last would the era of great discoveries be at an end. It is significant of the progress made since that time, that in the same year each of the three areas should be represented by important books of travel, neither, moreover, being entirely without a predecessor in the same field. Colonel Monteil's and M. Maistre's books deal with two respectively, while for the third we have Captain Bòttego's account—which fully deserves to rank with those already mentioned—of his explorations (with Captain Grixoni) in the Somali and Galla countries in 1892–93.* Although Captain Bòttego has been quickly followed by other travellers, his journey will always retain the distinction of having been the first to throw light on the hydrography of the upper basin of the Jub, of which our previous knowledge was of the vaguest. Our acquaintance with the climatology of this part of Africa was also extremely defective, so that the meteorological record, in which the traveller notes daily both the temperature at 6 a.m., noon, and 6 p.m. and the state of the sky, with the nature and duration of rainfall (if any), cannot fail to be of service. Besides a general map on the scale of 1 : 4,000,000, there are three large-scale sectional maps (1 : 1,000,000). On these the approximate limits of the fertile and arid regions are shown, the latter occupying apparently the whole surface (except the river valleys) at a distance from the hilly districts whence the streams take their rise. On the head-streams of the Jub, however, virgin forests were met with, which excited the admiration of the travellers.

Much information is likewise to be gained as to the Galla and Somali tribes, a chapter being devoted to an account of the latter and of the sultanate of Lugh, on the middle course of the Jub.

The next book to be noticed† takes us to almost the opposite extremity of the continent, but although the region dealt with is outside the limits of "Central Africa," it is one hardly better known than any tract within that area. On this account the additional details which Mr. Harris now gives of his adventurous journey to Tafilet are welcome, although the circumstances under which the journey was made naturally did not permit the carrying out of scientific observations. The fact that Mr. Harris was the first Englishman to cross to the south of the Atlas in itself gives an interest to the book. The only two Europeans who had preceded him to Tafilet, Caillié and Rohlfs, had reached the oasis from

* 'Il Giuba Explorato,' etc. Rome: E. Loescher & Co., 1895.

† 'Tafilet.' By Walter B. Harris. Illustrated by Maurice Romberg. Edinburgh and London: Blackwood, 1895.

other directions (the former passing through from south to north in 1828, and the latter arriving from the south-west in 1862 and from the north in 1864), so that Mr. Harris, coming from the west, was really breaking new ground, and his descriptions and illustrations of the scenery of the Atlas and its Berber strongholds, as well as his notes on the inhabitants, are of some value. The hardships of the journey were not slight, but the English traveller was fortunate in avoiding the suspicions which so nearly proved fatal to Rohlfs, though it is true the presence of the Sultan at Tafilet, with two Europeans in his camp, limited the time during which it was necessary to maintain the disguise adopted.

In connection with the early history of Tafilet, and its old capital Sijilmassa, Segelmessa, or Sijilmasiyah (the ruins of which were seen by Mr. Harris), it may be worth noting that Ibn Batuta visited the district in the fourteenth century, and even then extolled the dates, which are now so largely exported to the London market.

Before proceeding to notice one or two African books of a different class to the preceding, two more accounts of travel may be mentioned, which, however, contain scarcely enough of geography to entitle them to longer notice. These are Sir H. Colvile's 'Land of the Nile Springs' and Captain Swayne's 'Seventeen Trips through Somaliland,' both published last year. The latter contains a map reduced from the original surveys by the author for the Government of India.

In the two volumes dealing with Africa in the new issue of 'Stanford's Compendium,' an entirely fresh treatment of the subject was rendered indispensable by the immense changes introduced since the last edition of the older work was published. This has been well carried out by Mr. A. H. Keane, who has brought the subject-matter as well up to date as the rapid march of events in this continent will admit. The bulk has been extended to nearly double that of the former book, and increased attention has been paid to the historical, commercial, and ethnological sides of the subject, the last being no longer relegated to an appendix. The author's well-known qualifications as an authority on ethnological questions makes this a particularly useful feature of the plan. The difficulty of selecting a satisfactory subdivision of the subject has been well met on the whole. The great natural contrast between North and South Africa, both as regards physical features and inhabitants, affords a suitable division between the two volumes, though it may be noted that Ratzel is disinclined to lay so much stress on the differences between the Bantu and true negroes as Mr. Keane does. The division into chapters is based rather on political than natural facts, the case of the "Black zone," which is treated as a whole, being, however, an exception. The coast lands of Upper Guinea are included under that heading. As regards the arrangement within the chapters, a somewhat clearer distinction between the broader subdivisions might perhaps have facilitated reference. The description of physical features

seems also somewhat unnaturally placed after the political and historical survey; but the reason may possibly be a desire to bring into prominence at the outset the political facts which will in the future tend more and more to individualize the various regions.

From a purely geographical point of view, M. Vuillot's book on the Exploration of the Sahara* would perhaps have been of more general use if its plan had admitted the inclusion of the whole of that region within its scope. As, however, the main idea which underlies the whole is the elucidation of the work done in furtherance of the extension of French influence in the Sahara, and of the Trans-Saharan railway project in particular, the author confines himself to those journeys—certainly by far the most numerous—which led through the regions south of Morocco, Algeria, and Tunis. Thus no mention is made of the earliest modern Trans-Saharan journeys—those of Hornemann, and of Denham, Oudney, and Clapperton; though, as Barth remarks in his preface, the labours of these materially assisted their successors—while the work of Nachtigal also falls without the sphere of the book. Nor is there any reference to the history of the Sahara and its trade previous to its exploration by Europeans during the present century. As far as it goes, however, the story is fully and clearly told, the particular importance of each journey being carefully brought out, while the numerous route-maps scattered through the text, in addition to the excellent general map at the end, greatly facilitate the comprehension of the subject. Considering the large number of French Saharan explorers, whose works are not always accessible to general readers, the book will be extremely serviceable to those desirous of acquainting themselves with the details of French enterprise in this region. In the concluding chapter the author discusses the measures most urgently needed to secure to France the benefit of its trade, as to the prospects of which he shares the sanguine views prevalent among his countrymen.

The last book on our list is the useful bibliography of the Congo,† which has been prepared under the superintendence of M. A. J. Wauters. The care and labour which have been expended on this work may be judged from the fact that the entries include, in addition to books, not only articles from geographical and other periodicals, but also particular chapters of larger works which treat of some one branch of the general subject. It is restricted, however, mainly to books, etc., published since 1880, though a few standard works of an earlier date, such as Tuckey's narrative, are included. For the early literature of the subject, reference is made to the bibliographies of Gay and Paulitschke. The book is divided into sections, embracing, in addition to more general subjects,

* 'L'Exploration du Sahara.' Par P. Vuillot. Paris: A. Challamel, 1895.

† 'Bibliographie du Congo, 1880–1895.' Par A. J. Wauters, avec la collaboration de M. Ad. Buyl. Brussels: Office of the *Mouvement Géographique*, 1895.

the various branches of scientific and economic geography, the slave trade, missions, etc. The final arrangement is an alphabetical one under authors' names.* M. Wauter's book should be a most useful guide to the voluminous Congo literature of recent years.

BOUNDARIES OF BRITISH GUIANA—THE EVIDENCE OF MAPS.

By CLEMENTS R. MARKHAM, C.B., F.R.S., President R.G.S.

[In a communication to the *Times* of February 6, Mr. Markham examines the evidence afforded by maps as to the boundary between British Guiana and Venezuela. It will be useful for handy reference to reprint that communication here. A few slight corrections have been made, and some political references have been omitted.]

The evidence of maps in boundary questions is important both directly and as illustrating and supporting the evidence of other documents. In the elucidation of the question of the limits of British Guiana, the special light thrown upon it by cartographic documents is of more than ordinary importance. As the map-room of the Royal Geographical Society is a national institution, containing a collection of great value which serves to illustrate the question in its various bearings, it has become a duty to place the public, both in this country and in America, in possession of the cartographic evidence in the Society's collection. Chief Justice Daly, the venerable president of the New York Geographical Society, has already performed a similar useful service by reviewing the evidence of the maps in the collection of that society (see *New York Herald*, January 19, 1896).

The Guiana maps are naturally divided into four groups—first, the early maps showing the names by which the region was first known; second, the maps derived from Spanish sources; third, the maps setting forth the boundaries of Dutch Guiana; and, fourth, the results of more recent British discoveries and surveys.

Our examples of the first group are numerous, and the following are representative as regards the region between the Orinoco and the Amazon. The famous atlas of Ortelius (1570) contains a map of South America with the word Caribana occupying the space between the two great rivers. Hondius, in his atlas of 1623, also names the region Caribana, with the word Guiana more inland. The two Amsterdam atlases of Visscher (1651) and Blaeuw (1665) have the name Guiana, while Janson and Herman Moll follow Blaeuw. The word Caribana is derived from Carib, and indicates the country occupied by the Carib Indians. In the days of Raleigh the name was given to a chief of one of the tribes, also spelt Carapana. The evidence derivable from these early maps, from 1570 to about 1670, is that Caribana, the region now called Guiana between the Orinoco and the Amazon, was not occupied by the Spaniards, but by independent Carib tribes.

Spanish claims were not, therefore, derived either from discovery or occupation, but from an imaginary title conferred by their interpretation of the Bull of Pope Alexander VI., as modified by the Convention of Tordesillas, dated June 7, 1494. According to this arrangement, a meridian line was to be drawn from pole to

* It may be of use to mention that English authors not unfrequently appear under names not properly part of the surname (Travers Twiss, Silva White, etc.).

pole, at a distance of 370 leagues west of the Azores and Cape Verds, which were assumed to be in the same longitude. All to the westward of the line was to belong to Spain; all to the eastward to Portugal. The position of the meridian was never fixed, and the two countries continued to dispute over it until they ceased to have any American colonies. It depended on the point of departure, the number of leagues in a degree, and other details. The Spanish interpretation is shown on the anonymous map of 1527, sometimes ascribed to Fernando Columbus, and on the Ribero map of 1529. It makes the Pope's meridian strike the American continent a little west of the mouth of the Amazon, and thus includes all the Guianas and half Brazil on the Spanish side. The Portuguese view is shown on the Cantino map of 1502 and others, and Mr. Harrisse, the highest American authority on this subject, places the Portuguese version of the Pope's meridian, as modified by the Tordesillas Treaty, in 62° 30′ W. of Paris ('Les Corte-Real,' p. 86). This leaves Guiana on the Portuguese, or eastern, side of the line, and disposes of the Spanish claim and of the more extravagant Venezuelan claim which is based on it. But the true position of this meridian has never been decided, and no country, other than Spain and Portugal, was in any way bound by it. This explanation is necessary, because the Borgian meridian represents the sole ground on which the claim of Spain and of her inheritor, Venezuela, is based. It is also necessary to bear in mind that the eastern province of the Spanish Captaincy-General of Venezuela was called Nueva Andalusia, and extended from Cumana to the Orinoco, including the few Spanish settlements on the right bank of that river. When a map-maker wanted to set forth the imaginary title derived from the Papal Bull, Nueva Andalusia was written all over the map, including the Guianas, down to the Amazon.

We may now proceed to review the second class of maps derived from Spanish sources. We first find "Neuva Andalusia" written across Guiana on an undated map of De l'Isle, who lived between 1675 and 1726, and on others published by Mortier and Couvens, of Amsterdam. These maps represent the last tradition of the Papal Bull, which was fast dying out. One of the first maps which acknowledges existing facts is that in the French translation of the work of Father José Gumilla in 1758, which shows the correct Dutch boundary along the mountains of Imataca, separating the tributaries of the Essequibo from those of the Orinoco. By the Treaty of Westphalia, in 1648, more than a century earlier, it was settled that Spain and Holland should continue in possession of such territories as either respectively then held or possessed, those territories not being further described. In 1621 the States-General had granted a charter specifying the mouth of the Orinoco as the western limit of the territory of the Dutch West India Company, and Spain subsequently recognized the right of Holland to the whole basin of the Essequibo by implication, in various ways. But the Spaniards were naturally wedded to their Papal Bull, and were slow to allow long-established facts to appear on their maps. Father Gumilla set an excellent example in 1758. But then followed a map published in 1775 by Juan de la Cruz Cano, on which a line was drawn, not to show the boundary claimed by the Dutch and acknowledged by Spain, but the supposed limit of territory actually settled by the Dutch and under cultivation. This line follows the Essequibo to the junction of the Cuyuni, then ascends the Cuyuni to the junction of a little stream called the Tupura, and follows the Tupura to its source, whence a line is drawn to the source of the Moroko, the course of which it follows to the Atlantic. The whole basin of the Pomarun is thus included. But it by no means follows that the territory beyond this line was claimed as Spanish. It represents the country within the sphere of Dutch influence not actually settled by the Dutch at that time, but occupied by the Caribs and other tribes who were allies of Holland, and had never allowed a Spaniard to enter it.

The Cruz map, with its boundary-line, continued to be copied by map-makers for many years; for instance, in 1807 by L. D'Arcy de la Rochette, in 1808 in Cary's Atlas, in 1810 in Arrowsmith's Alcedo Atlas, and also by travellers who derived their information from Spaniards in Venezuela, such as Humboldt (1800–1804) and De Pons (1801–1808). Humboldt describes the line drawn by Cruz, but adds that it is not recognized by the Dutch, who place their boundary at the river Barima, and thence to the Cuyuni. De Pons ('Voyage à la Partie Orientale de la Tierra Firme:' Paris, 1806) also describes the line of Cruz, observing, however, that the Spaniards practically do not occupy one inch of the basin of the Essequibo, where the natives defend their independence and are allies of the Dutch. The line of Cruz is also adopted by General Codazzi in his well-known map of Venezuela published in 1840, who shows the positions of several old Dutch forts and posts. This Cruz line gives the English both banks of the Essequibo from the junction of the Cuyuni to the mouth, and is sanctioned not only by Spanish authorities, but by Codazzi, the highest Venezuelan authority, who died in 1859. Yet the Venezuelans now claim the line of the Essequibo to its mouth. They have gone so far as to publish a second edition of the Codazzi map in 1876, under the name of one Miguel Tejera, with the words "Territorio usurpado por los Ingleses," written over the part conceded both by the Spaniards and by Codazzi!

The geographical dictionary of Antonio de Alcedo, published in 1787, is the first Spanish work which begins to acknowledge established facts. Yet, under some heads, even Alcedo clings to the Papal Bull. Thus Nueva Andalusia is described as extending over Dutch, French, and Brazilian Guiana to the mouth of the Amazon. But when he descends to details, he tells us that the Dutch had settlements on the Pomarun surrounded by plantations and cultivated lands, and that they extended their influence up the Mazarusia, Cuyuni, and other rivers.

We now come to the third group of maps, which shows the real boundary of Dutch Guiana. This group is based on the labours of the illustrious French geographers of the seventeenth and eighteenth centuries, commencing with the beautiful atlas of Sanson, published in 1669. The name of Caribana here appears across the territory from the Orinoco to the Amazon, while Nueva Andalusia is correctly shown as extending from Cumana to the Orinoco, with a small tract on the right bank of that river. The map in the atlas of F. de Witt, published in 1688, follows Sanson. But it was D'Anville, the greatest geographer of his age, who in 1748 first delineated the true boundaries of Dutch Guiana. He followed Sanson and F. de Witt, but he would not be satisfied without authentic and original information. He, as geographer to the King of France, received authentic information from the Spanish Government. Moreover, as a geographer, he would see that the Dutch, having been established for a century and a half on the Essequibo, and having extended their influence up its tributaries, had a right to claim the whole basin of that river, allowing for legitimate territorial expansion; for no part was occupied by Spaniards, with the exception of some religious missions in the valley of the Yuruari. Chief Justice Daly has well illustrated this point by the case of Louisiana. The French colony extended little beyond the delta of the Mississippi, but the French Government ceded to the United States the whole sphere of its influence, from the mouth of that river to its head-waters. D'Anville accordingly showed the Dutch boundary as including the whole basin of the Essequibo. In the 1755 English edition of D'Anville's Atlas the same boundary-line is shown, and in the 1772 edition the boundary is coloured. Since that time map-makers have been almost unanimous in following D'Anville. In Jeffrey's West India Pilot (1775) the Dutch boundary begins near the mouth of the Barima, and also on the

chart of Captain Thompson (1783). The same boundary, giving the whole basin of the Essequibo to British Guiana, is shown on every map of any authority down to Kiepert, Stieler, and Andrée. More recent editions show the first Schomburgk line.

By the Treaty of 1814 the Dutch ceded the portion of Guiana which includes the basin of the Essequibo to Great Britain. Spain was a party to the treaty, at a time when that country was in full possession of Venezuela.

The fourth group of maps shows the British discoveries and surveys since 1830. The discoveries were energetically prosecuted by the Council of the Royal Geographical Society from 1834 to 1839, for at that time the head-waters of the Essequibo and its tributaries were entirely unknown. The Council selected an accomplished Prussian traveller, named Robert H. Schomburgk, to explore British Guiana, paying his expenses and drawing up his instructions. During his first scientific expedition he ascended the Essequibo far beyond any point previously reached, discovered the King William Falls, and explored the course of the Rupununi. In 1836 he explored the Berbice and Corentyns to their sources. In 1837 and 1838 he explored the Essequibo to its source, and connected his scientific work with that of Humboldt on the Upper Orinoco. In 1840 Schomburgk received the gold medal of the Royal Geographical Society, and in the following year he became her Majesty's Commissioner to survey the boundaries of British Guiana. He explored the Waimi and Barima, and delineated a boundary by which a large extent of British territory, comprising the whole valley of the Yuruari, was given up to Venezuela. Even then the Venezuelans had commenced their encroachments into British territory, and the line was designed to satisfy them and to secure a good understanding. The line was drawn on a just and well-defined principle, conceding to Venezuela the Yuruari and Curumu valleys, which had been occupied by the Venezuelans, and retaining the territory which had never been occupied by Spaniards or Venezuelans. The line commences at the mouth of the Amacura, on territory which had belonged to Holland since 1621, follows that river to its source, includes the basins of the Barima and Barama, and then follows down the Akrabisi to its junction with the Cuyuni. That river, then, becomes the boundary to its source. A first and a second Schomburgk line has been shown on maps, and this has been interpreted as vacillation. But there has been no change in the line itself, as explained above. The change on the maps is merely due to variations rendered necessary by more recent discoveries and more accurate surveys. Five of Schomburgk's maps were published in the *Journals* of the Royal Geographical Society; and a very excellent map of British Guiana, compiled from them on a scale of 7 miles to an inch, was engraved in 1875. Sir Robert Schomburgk also drew an excellent map for the edition of Raleigh's 'Guiana,' which he edited for the Hakluyt Society.

Since the days of Schomburgk, the falls of Kaieteur on the Potaro have been discovered by Mr. C. B. Brown, Mount Roraima has been explored by Flint, Whitely, and im-Thurn. Mr. im-Thurn has done a great and useful work in the north-west district of British Guiana, and Mr. G. G. Dixon has discovered the source of the Barima.

It will have been seen, from the evidence of maps, that Spain had no claim to British Guiana; that Venezuela, therefore, inherits no claim; and that even if the territory was adjudged not to belong to Great Britain, it in no way follows that it belongs to Venezuela. The right of Great Britain rests partly on discovery, on the Dutch possession of three centuries, on effective occupation, and on treaty. The evidence derived from maps is important in itself, and it will certainly serve to illustrate and give additional force to the documents in the forthcoming Blue-book.

CUINET'S 'TURKEY IN ASIA.'*—REVIEW.

By GEO. G. CHISHOLM, M.A., B.Sc.

THE first two volumes of this laborious and important work have already been briefly noticed in the *Proceedings* (1891, p. 739, and 1892, p. 569), and the parts in which the subsequent volumes have been issued have each been entered, as they appeared, in the Bibliographical notes of the *Journal*. The work continues to the end to be of the character described in the notices referred to. It is essentially a work of detail, the nature of which is sufficiently indicated in the preface, where it is stated to be "a compilation of statistical notes made on the spot in the course of different journeys made during the past twelve years," that is, previous to 1890. The arrangement of the information is in accordance with the administrative divisions—vilayets, sanjaks, and kazas. The headings under the vilayets are: Administrative division; population by races or religions; manners, customs and origins of the population; schools; commerce; navigation; climate; agricultural products; mines; forests; cattle; rivers; lakes; fisheries; roads; means of transport; industrial products; revenue and expenditure. The headings vary somewhat under the different vilayets. Some of them are repeated under the sanjaks, and some under the kazas. From this account it will be seen that no attempt is made at a description of Turkey in Asia from a geographical standpoint, and it would be very difficult to collect from this book a general idea of the region to which it relates. In the introduction there is a brief account of the administrative system of Turkey, followed by a table of the vilayets of the whole Turkish empire; but there is nothing else of a general nature, and no assistance is given in comparing the information given under the same headings in different sections of the book. Thus, if we find under the vilayet the statistics of agricultural produce, we have to turn up all the corresponding tables under the sanjaks composing the vilayet if we want to find out the proportions in which these products are distributed over the area. A work of this kind obviously requires an index, but none is supplied. Still, with all these drawbacks the work is of great value, supplying as it does information which in most cases can be found nowhere else, at least in a collected form. Notices of the chief towns are given under the kazas, and with reference to them, as well as under the heading "Origins of the Population," numerous interesting historical particulars are inserted. Under the head of climate, which is repeated at every sanjak, there is a large number of valuable notes as to the health of different localities.

Most of the figures in the book must, of course, be taken as merely approximate estimates, and it should be mentioned that for the areas it

* 'La Turquie d'Asie.' By Vital Cuinet. Paris. 4 vols. 1890–95.

would appear, from the procedure followed under the first vilayet treated of (Trebizond), Cuinet has merely adopted the official figures in *deunums* converted into square kilometers at the rate of 9·193 ares (·0009193 sq. km.) to a *deunum*, and that accordingly Cuinet's areas are not to be preferred to the careful calculations of Wagner and others. The discrepancies between Cuinet's areas and those of more trustworthy authorities are in some cases wide. For example, the island of Crete, which, in accordance with the classification of the official salnameh, is treated in this work as part of Turkey in Asia, has an area assigned to it of 7640 sq. km., against the 8618 sq. km. of the *Bevölkerung der Erde*, and the 8694 sq. km. of Strelbitsky.

Besides a general map showing the administrative divisions of Asiatic Turkey (exclusive of Turkish Arabia, which is not embraced in this work), there are special maps of the vilayets. In the preface these are all stated to be on the scale of 1 : 1,000.000, but this is not the case. The only maps on that scale are those of the vilayet of Brussa (along with the mutessariflik of Ismid) and the vilayet of Constantinople, and the scales actually adopted vary from 1 : 1,000,000 to 1 : 2,500,000. These maps are somewhat roughly drawn, minute accuracy not having apparently been aimed at. The lines of latitude and longitude are sometimes inconsistent, and the kilometer scales inaccurate. The maps do not show the surface features, but they give, among other things, the boundaries of the sanjaks and kazas, carriage roads and railways completed and projected, bridle-paths (*sentiers*), and the distribution of woods and forests and of salt-pans.

THE GEOGRAPHY OF MAMMALS.*

By W. L. SCLATER, M.A., F.Z.S.

No. IV.—The Ethiopian Region.

Sect. 1.—Boundaries of the Ethiopian Region.

The Ethiopian Region contains the whole of Africa south of the Sahara, together with Southern Arabia and the island of Madagascar. As in all other cases where there is a long land-frontier between two neighbouring regions, so here it is impossible to lay down anything but an approximate line of demarcation between the Ethiopian and Palæarctic Regions.

The boundary usually adopted is the line of the tropic of Capricorn, which strikes Africa between Morocco and Senegambia, runs through the middle of the Sahara, crosses the Nile between the first and second cataracts, and passes through Arabia to the neighbourhood of Oman, on the Persian Gulf. Most of the country through which this line passes is desert, and its mammalian fauna is consequently meagre. Mr. O. Thomas (6) has recently published an account of a collection of mammals received at the British Museum from Oman, which shows, as would

* Continued from vol. v. p. 483. Map, p. 344.

naturally be expected, that "the geographical relationships of this district are about equal with Africa and India; three of the species being distinctly African in affinities, three Indian, and the remainder either peculiar or widely spread and of no special significance." On the whole, therefore, the line of the tropic of Capricorn, adopted by Wallace, seems to be a very suitable boundary.

Besides the island of Madagascar and its appendages, which contain one of the richest and most interesting of all known insular faunas, and forms a very important subregion, which will be considered in greater detail below, the Ethiopian Region possesses other islands. These, however, are mostly Oceanic, and are not nearly of so great importance as Madagascar.

The Azores, Madeira, Canaries, and Cape Verde groups, although geographically African, seem to have derived their faunas chiefly from Europe. They therefore belong to the Palæarctic Region, and will be dealt with under that head.

The islands of St. Helena and Ascension, situated in the South Atlantic, are both of them of volcanic origin, and separated from the mainland of Africa by more than 800 miles of deep water. Neither of these islands possesses any vertebrate land-fauna at all. The only land-groups well represented in them are the beetles and the land-shells—a study of which shows that the affinities of these islands are to Southern Europe and Southern Africa, but that the fauna is in all probability an exceedingly ancient one; since its peculiarities are very great, and opportunities of migration of new forms to these islands have been few and far between.

The other islands in the Atlantic connected with Africa are Fernando Po, Prince's Island, St. Thomas, and Anno Bon, all situated in the Gulf of Guinea at various distance from its head. Fernando Po, an island of some 40 miles in length, but separated from the mainland by a somewhat shallow sea about 20 miles across, is inhabited by a considerable number of mammals. Among these are species referable to no less than nine genera, such as *Hyrax*, squirrel, porcupine (*Atherura*), linsang (*Poiana*), bats, lemurs, and monkeys. There seems to be no record of the bat and of two of the monkeys occurring on the mainland of Africa, though it is quite possible that they may be found there at some future date, since Fernando Po has been apparently much more thoroughly explored than the adjacent mainland.

The other islands above mentioned, Prince's island, St. Thomas, and Anno Bon, are all considerably more distant from the coast of Africa, and, so far as we know, do not possess any native mammals. A certain number of land-birds have been obtained from these islands, and a few of these are peculiar, but they are all closely allied to forms that occur in the neighbouring West African mainland.

The most important islands in the Indian Ocean are, apart from Madagascar, Socotra, the Seychelles, the Amirante islands, the Comoros, and finally Réunion, Mauritius, and Rodriguez.

Socotra is situated about 150 miles due east of Cape Guardafui, the extreme eastern point of Africa. Its fauna and flora were carefully investigated some years ago by Professor Bayley Balfour (1). He found that the only mammals inhabiting the island are a bat, which he was unable to obtain, and a civet cat (*Viverricula*), met with also in South Asia, and probably introduced by human agency.

The Seychelles are distant about 700 miles from the northern point of Madagascar in a north-easterly direction, a more or less continuous chain of islands (Amirante, Providence, and Farquhar) forming a series of stepping-stones between them. But two narrow deep channels of over 1000 fathoms run between the Seychelles and Amirante on the one hand, and between Amirante and Providence on the other, thus cutting the Seychelles off from Madagascar by their deep water.

There do not appear to be any indigenous terrestrial mammals in the Seychelles,

except two bats, which have been recorded as occurring there. The land-birds are most of them peculiar, though belonging to genera found in Madagascar or Africa; the reptiles and amphibians are fairly numerous for islands such as these, and several of the species are not found elsewhere. It is difficult to say whether these islands have ever had a land-connection with Madagascar, but probably, if such were ever the case, it was at a considerably remote time, geologically speaking.

The Comoros are a group of several islands lying about midway between the most northerly point of Madagascar and the mainland of Africa. They are separated from Africa by the Mozambique channel, more than 1000 fathoms in depth, while the depression between them and Madagascar is considerably less. Inhabiting these islands there are three bats, two of the genus *Pteropus*, entirely absent from the mainland of Africa, but found in Madagascar and the other islands of the Indian Ocean. There is also a peculiar species of Lemur (*Lemur mayottensis*) and the Indian civet (*Viverricula*), which last is also found in Madagascar and Socotra, and has in all probability been introduced by human agency. A fair proportion of the land-birds of the Comoros, though in some instances peculiar, belong to Madagascar forms, and everything goes to show that the relations of this group of islands is with Madagascar rather than with the mainland.

The islands of Réunion, Mauritius, and Rodriguez are distant from Madagascar in an easterly direction 450, 550, and 800 miles respectively. They are all of volcanic origin, and separated from Madagascar by water of more than 2000 fathoms in depth. As would be expected, these islands are thoroughly Oceanic, and possess no indigenous mammals or amphibians; while the land-birds are few in number, and belong mostly to genera found in Madagascar.

The most remarkable feature, however, of the fauna of these islands is the former existence of a group of flightless ground-birds now quite extinct, but some of which were found in great numbers when the islands were first discovered. These are the dodos of Mauritius and Réunion respectively, and the solitaire of Rodriguez. These birds form a distinct family—the *Didida*, probably allied to the pigeons, but of somewhat obscure affinities. It seems that the ancestors of these birds must have reached the islands in very early times, and that most of the striking peculiarities exhibited by them were gradually acquired after their arrival in the group.

We may, at any rate, conclude that these three islands are truly Oceanic, and that they have never had a land-connection with Madagascar or elsewhere.

Sect. 2.—General View of the Mammal-Fauna of the Ethiopian Region.

The Ethiopian Region, as will be seen by looking at the table of the numbers of families, genera, and species given at the end of the first article of this series (*Geographical Journal*, 1894, p. 104), is the richest of the six regions as regards the total numbers of its families, genera, and species of mammals, although the percentage of peculiar forms not found in other regions is hardly so high as in the Neotropical and Australian Regions. This may, however, be accounted for by the consideration that there is a long land-frontier between the Ethiopian and the Palæarctic Regions, though this is chiefly occupied by desert.

Out of the nine orders of terrestrial mammals the Ethiopian Region contains representatives of seven, the marsupials and monotremes being alone absent. The edentates of this Region are represented by two families. One of these, of which the sole genus is the aardvark (*Orycteropus*), is quite restricted to the Region. The other, containing the scaly anteaters (*Manidæ*), is found also in the Oriental Region. These two forms are in most respects more closely allied to one another than to any of the edentates of the New World.

It is, however, the animals belonging to the order Ungulata which form so conspicuous a factor in the Ethiopian fauna. These are distributed among twenty-nine genera, of which no less than twenty are not found anywhere outside this Region.

The antelopes, of the family *Bovidæ*, which are most of them large animals living in vast herds in the more open country of eastern and southern Africa, take up the greater number of these twenty-nine genera. These are perhaps, at the present epoch, the most notable feature of the African fauna, but will doubtless, owing to the unceasing persecution of hunters and sportsmen, become rapidly less so. Already the larger antelopes are nearly extinct in Cape Colony south of the Orange river, and there can be little doubt that, unless special precautions are taken, the large mammals of Africa will very soon disappear like those of the United States before the express and repeater.

Beside the numerous genera of antelopes, the Ethiopian Region has exclusive possession of two other conspicuous forms of the ungulates—the hippopotamus and giraffe, each of which forms a special family, while it shares the rhinoceroses, the elephants, and the chevrotains with the Oriental, and the horses (*Equidæ*) with the Palæarctic Region. The only important family of ungulates not found in the Ethiopian Region is the deer-family (*Cervidæ*). The total absence of this otherwise widespread family it is difficult to explain. Palæontology does not help us much, since the members of the deer-tribe appear to have been already well established and abundant in Europe during early Pliocene times, and were contemporaneous with antelopes and other ungulates, which have availed themselves of the opportunity of spreading southwards to Africa, while the *Cervidæ* have apparently remained obstinately attached to the Palæarctic Region.

Turning now to the rodents, we find that the Ethiopian Region possesses representatives of a considerable number of genera, twenty-seven of which, out of a total of thirty-nine, are confined to the region. Two of these genera are sufficiently distinct to be entitled to family rank. These are, first, *Anomalurus*, a form resembling the flying squirrels in having a flap of skin available for imperfect flight extended between the fore and hind limbs. But the anomalures differ from the true flying squirrels (*Pteromys*) in having a long cartilaginous process extending from the elbow-joint to support the parachute, and also in being provided with strong imbricated scales attached to the lower surface of the tail, which are probably of great assistance in climbing.

The second peculiar rodent of family rank is *Lophiomys*, a curious arboreal animal allied to the rats, but differing from them in several anatomical features, and in having a long crest of hair upon the back. Only one species is known, which is restricted to North-East Africa.

The distribution of a third Ethiopian family of rodents (*Octodontidæ*) is particularly interesting, as it is represented in South America by a considerable number of genera, and is not found elsewhere except in the Ethiopian and on the borders between the Ethiopian and Palæarctic Regions. There are four African genera of this family, each with a single species, so that in the Old World the group appears to be in a state of decay. The only light thrown on this curious case of discontinuous distribution is the occurrence of a fossil genus (*Pellegrinia*) allied to the African forms in the Pleistocene beds of Sicily. This indicates that members of this family once had a wider distribution northwards than they now retain.

The Carnivora are well represented in the Ethiopian Region. This is especially the case with the family of civets (*Viverridæ*), only found elsewhere in the Palæarctic and Oriental Regions. Out of a total number of seventeen genera,

three only are found outside this region, and out of the remaining fourteen, six are confined to the island of Madagascar.

Another remarkable fact about the Ethiopian Carnivora is the entire absence of the otherwise widespread family of bears (*Ursidæ*). This group has existed in Europe since the time when the Upper Pliocene beds were laid down, and their remains have been also found in the Siwalik deposits of India, which are possibly of even greater age. It seems, therefore, very strange that the bears should never have reached Africa, when so many of the other genera found in the same deposits have managed to do so.

The Insectivora of the Ethiopian Region are fairly numerous, and show considerable specialization. Out of the six Ethiopian families three are not found elsewhere, and one of the others only extends into the Palæarctic Region as far as Northern Africa. This is the family of elephant-shrews (*Macroscelidæ*).

The bats of this Region present few particular features of interest, belonging nearly all to widely spread genera of widely spread families. Among those that are peculiar the most important is *Epomophorus*, containing eight or ten species of large fruit-eating bats, with long rather horse-like heads, and expansible and peculiarly folded lips. The *Epomophori* seem to take the place, in Africa, of the genus *Pteropus*, which, although represented by several species in Madagascar, and even in the Comoros (which are separated from the mainland by only a comparatively narrow strait), is entirely absent from the African mainland itself.

Finally, among the Primates we have two families of lemurs, one containing only a single species (*Chiromyidæ*) confined to Madagascar, the other (*Lemuridæ*) containing a large number of genera, of which ten are confined to Madagascar, two are found on the mainland of Africa, the other two in the Oriental Region.

The monkeys of the Ethiopian Region, which are entirely absent from Madagascar, belong to two families, both of them shared with the Oriental. The genera, however, seven in number, are all without exception confined to this region.

Summarizing these results, therefore, we find that the Ethiopian Region is characterized by the exclusive possession of ten families of mammals, namely—

Orycteropodidæ (aardvark).	Protelidæ (aard wolf).
Hippopotamidæ (hippopotamus).	Potomogalidæ (river shrew).
Giraffidæ (giraffe).	Centetidæ (tenrec).
Anomaluridæ (spiny-tailed squirrel).	Chrysochloridæ (golden mole).
Lophiomyidæ (crested tree-rat).	Chiromyidæ (aye-aye).

and by the presence of ninety-nine endemic genera.

On the other hand, among a considerable number of families not represented in this region, the following five are all widely spread elsewhere, and may therefore be considered as typical "lipotypes" of the Ethiopian Region:—

Cervidæ (deer).	Ursidæ (bears).
Tapiridæ (tapirs).	Talpidæ (moles).
Castoridæ (beavers).	

Sect. 3.—Subdivision of the Ethiopian Region.

In subdividing the Ethiopian Region into subregions, it must be always remembered that one of the subregions far predominates over the others in speciality and distinctness, and that the remaining subregions all resemble one another more or less closely, and are difficult of separation.

This subregion, which is so distinct from the others, consists of the large island of Madagascar, together with the island groups in its immediate vicinity, viz. the Comoros, the Seychelles, and Amirante to the north, and the Mascarene islands

(Réunion, Mauritius, and Rodriguez) to the east. Whatever other conclusions may be arrived at regarding the best mode of dividing the Ethiopian Region, every authority is, I think, agreed on this matter, the only doubtful point being whether the subregion in question is not well entitled to the full rank of a region.

On the African continent itself a fairly distinct subregion can be recognized, extending all over the forest country of Western Africa from the Senegal river over the whole Congo basin, or perhaps rather further south. The best inland boundary of this subregion would probably be the water-parting between the West African rivers on the one side, and the Nile on the other. There can, at any rate, be now little doubt that the West African fauna extends as far eastwards as the western bank of Lake Tanganyika. Even on the shores of Victoria Nyanza, according to Herr Neumann's (5) recent researches, some typical West African forms are met with; but for the present it will be safer to restrict the West African subregion to the western watershed. The southern or Cape subregion, as defined by Wallace, includes only the country south of a line drawn from Walfisch bay, just to the north of the tropic of Capricorn, to Mozambique. Since the publication of Mr. Wallace's book, however, much additional information has been obtained regarding the distribution of the mammals of Eastern Africa. Many of the animals formerly supposed to be confined to the southern end of the continent, have been shown to extend all through Nyasaland, at least as far north as Kilimanjaro. It will, therefore, be advisable to extend the boundaries of this subregion further north. The boundary adopted in this paper, as will be seen by consulting the map, runs from Angola in the west, along the southern water-parting of the Congo as far as Lake Tanganyika, passing thence to Kilimanjaro, and so on to the Indian Ocean along the Tana river.

The rest of Africa, including the Sahara, the southern portion of Arabia, and North-East Africa, will form a fourth subregion, which, however, does not contain nearly so high a percentage of endemic genera as the other three.

The Ethiopian Region may therefore be divided into four subregions as follows:—

1. The *Malagasy Subregion*, including Madagascar and its adjacent islands.
2. The *West African Subregion*, including the great equatorial forest of Central Africa contained in the basins of the western rivers, from the Senegal to the Congo inclusive.
3. The *Cape Subregion*, including all Africa south of the watershed of the Congo on the West and of the Tana on the East Coast.
4. The *Saharan Subregion*, consisting (if we exclude the Abyssinian plateau) chiefly of desert, or at any rate of a comparatively dry country, including the Sahara, Eastern Africa as far south as the Tana river, and Southern Arabia.

Sect. 4.—The Malagasy Subregion.

The island of Madagascar is separated from the mainland of Africa by the Mozambique channel, which, though only about 250 miles across at its narrowest point, is more than 100 fathoms deep throughout its extent.

For our recent knowledge of the fauna of Madagascar we are chiefly indebted to the great work of Grandidier (3). Unfortunately, up to the present time only the plates of that part which deals with the mammals have been published.

Out of a total number of forty-three genera of mammals found in this subregion, no less than thirty are exclusively confined to it. Of the others, three occur also on the mainland of Africa, and the remaining ten—all of which are bats—are cosmopolitan, or at any rate extend beyond the limits of the Ethiopian Region.

The ungulates are represented in Madagascar by only one form—a peculiar river hog (*Potomochœrus edwardsi*) closely allied to the South African species, but still sufficiently distinct to have earned a title to a separate appellation. With this exception, the ungulates, so numerous and so conspicuous a feature on the African continent, are entirely absent from Madagascar.

The rodents are represented in this subregion by five genera of mice, containing six species, all confined to it.

The Malagasy Subregion possesses several remarkable forms of carnivores, of which the most remarkable, perhaps, is *Cryptoprocta*—a large cat-like animal allied to the civets, but sufficiently distinct to form a separate subfamily of the *Viverridæ*. Belonging to the same family, too, is the fossa, closely resembling the Indian civet (*Viverricula*), and four genera with six species of mongooses, all confined to the island. Of these the most remarkable is *Eupleres*—a form the jaws and teeth of which are so weak and small, that it was at one time thought to belong to the Insectivora. On the whole, out of the seven genera of Carnivora found in the island, six are absolutely peculiar, and the seventh (*Crossachus*) is represented by a mongoose common over the greater part of Africa, and not improbably introduced into the island by human agency.

Among the Insectivora of this subregion even greater specialization prevails. There are seven genera of this order found in Madagascar, all confined to the island. *Geogale*, a small mouse-like animal about which little is known, is said to be allied to *Potomogale*, an aquatic otter-like animal found only in Western Africa. The remaining six genera make up the family *Centetidæ*, the affinities of which are somewhat doubtful, but seem on the whole to approach the Solenodonts, a group confined to the Greater Antilles. The best known of the *Centetidæ* is the tenrec—the largest member of the order, between 12 and 16 inches long, and devoid of a tail. The young of this creature are covered with spines like a hedgehog, but these are lost in the adult state.

The bats of Madagascar, as would naturally be expected, do not exhibit the great peculiarities found among the other orders of mammals. Out of twelve genera only one is confined to the island. The distribution of *Pteropus*, the genus of large tropical fruit-eating bats, often called flying-foxes, is interesting. Five members of this genus are found in the Malagasy Subregion, including two species in the Comoro islands, and although these islands are almost within sight of the mainland of Africa, not a single representative of the true *Pteropus* has yet been obtained on the continent. The strange distributional area of this genus has already been referred to (*Geogr. Jour.*, iv. p. 46). *Pteropus* is mainly confined to the islands of the Indian and Pacific Oceans, and has only one or two exceptional species on the great land-masses. The genus *Emballonura*, belonging to the insectivorous division of the bats, and distinguished, among other characters, by the fact that the tail penetrates the interfemoral membrane and appears free above, has a somewhat similar Oceanic distribution. It is found in Madagascar, and thence eastward as far as Samoa in the Pacific, but never on the mainland of Africa or Asia, although it has recently been obtained by Dr. Anderson in the Mergui archipelago, on islands quite close to the southern part of the Burmese coast.

Finally, among the Primates we reach the culminating-point of the fauna of this strange land. No less than eleven genera of lemurs, which form the lowest of the three divisions into which the Primates are divided, are entirely confined to the subregion.

Outside the subregion there are only five additional genera now in existence, two of them belonging to Africa proper, and three to the Oriental Region.

The lemurs are none of them very large; they are all arboreal animals, spending their lives retired in the forest, and, as a rule, strictly nocturnal. Though allied to the true monkeys, they have none of their vivacity and intelligence; they move but slowly, and have usually very large eyes, which are no doubt necessitated by their nocturnal habits. The lemurs inhabiting Madagascar are divided into two families: (1) the *Lemuridæ*, with ten genera and about thirty-three species, to which family, also, the African and two of the Oriental genera are generally assigned; and (2) the *Chiromyidæ*. The latter family contains only a single genus and species, the extremely anomalous aye-aye, discovered by the traveller Sonnerat in 1780. There are generally examples of this curious animal in the Zoological Society's gardens in London, but, unless especially aroused, they are seldom seen by daylight. Their chief peculiarity is the long, thin, ghost-like middle finger, with which they are said to extract wood-boring insects from their burrows, although their chief food in captivity seems to consist of succulent juices.

Of the extinct mammal-fauna of Madagascar we know as yet too little. Mr. Forsyth-Major (4) has lately described a large lemur (*Megaladapis*) differing considerably from those now inhabiting the island; while remains of two small lemurs and of two species of hippopotamus have been also met with. These remains, together with the bones of a large flightless bird (*Æpyornis*), apparently allied to other Ratite birds, are of a comparatively recent period.

On the whole, however, we cannot but presume that Madagascar originally obtained its animal life from the mainland of Africa. The striking differences between the present faunas of Africa proper and Madagascar are doubtless due to the fact that the great bulk of the existing African fauna is comparatively modern, and came from the Northern continent at the end of the Miocene or the beginning of the Pliocene times, while Madagascar was cut off from Africa before this eruption of Northern forms took place. Madagascar, therefore, appears to contain a sample of the ancient Ethiopian fauna, which has been almost exterminated on the mainland, but had survived here under the protection given by its separation from the adjacent continent. The fauna of the Malagasy Subregion, with that of the rest of Africa, may be summarized by the exclusive possession of—

(1) Five genera of the family *Muridæ*, among the rodents.

(2) Six genera of the family *Viverridæ*, among the carnivores.

(3) One genus (*Geogale*) of the family *Potamogalidae* (shared with the West African Subregion) and six genera making the whole of the family *Centetidæ*, among the insectivores.

(4) One genera (*Chiromys*) alone forming the family *Chiromyidæ*, and ten genera of the family *Lemuridæ*, shared with the African continent and the Oriental Region, among the primates.

Almost equally important is the absence of the following groups:—

(1) The orders *Edentata* and *Ungulata* (except *Potamochœrus*).

(2) The families *Sciuridæ* (squirrels), *Spalacidæ* (blind moles), *Octodontidæ*, *Hystricidæ* (porcupines), and *Leporidæ* (hares), among the rodents.

(3) The families *Felidæ* (cats), *Canidae* (dogs), and *Mustelidæ* (weasels), among the Carnivora.

(4) The Primates, other than the lemurs.

The following table shows the number of Madagascar mammals and their distribution:—

	Ungulata.	Rodentia.	Carnivora.	Insectivora.	Chiroptera.	Primates.	Total.
Endemic	0	5	6	7	1	11	30
African	1	0	1(?)	0	1	0	3
Cosmopolitan	0	0	0	0	10	0	10
Total	1	5	7	7	12	11	43

[N.B.—The "Endemic" genera are those confined to the Malagasy Subregion; the "African" genera are those common to Madagascar and the mainland of Africa; and the "Cosmopolitan" genera are those which range beyond the limits of the Ethiopian Region.]

Sect. 5.—The West African Subregion.

The West African Subregion, as defined above, does not contain nearly so large a proportion of peculiar genera as the Malagasy Subregion. At the same time, twelve out of a total of eighty genera of mammals that are found within its limits are not met with elsewhere. Moreover, we find that as a general rule the genera inhabiting other parts of Africa are here replaced by distinct species.

The Edentata are represented by one genus, *Manis*, the scaly anteater. Of the four known African species three are confined to this subregion.

Of the ungulates only one genus is endemic. This is *Hyomoschus*, a very curious aquatic form, which, together with an allied genus found only in the Oriental Region, forms a peculiar family distantly allied to the deer (*Cervidæ*). Many of the genera of ungulates, however, are here represented by peculiar species. Instances of this are the small hippopotamus (*H. liberiensis*), the red river-hog (*Potamochærus penicillatus*), the West African eland (*Oreas derbianus*), a peculiar species of wild ox (*Bos pumilus*), and several species of coney (*Procavia*).

The rodents do not present any features of great interest, the only peculiar genera being *Deomys* (allied to *Mus*), recently obtained from the Congo district; and the brush-tailed porcupine (*Atherura*), of which one species is found only in this subregion, and the other two are confined to South-East Asia. Four out of the five known species of the peculiar rodent-genus *Anomalurus*, already referred to, are also confined to the West African Subregion.

Turning now to the carnivores, there are found in the West African Subregion only, two remarkable genera, *Poiana* and *Nandinia*. Of these the former is closely allied to the genus *Prionodon*, a beautifully marked civet-like little animal of the Oriental Region, and the latter is affined to the palm civets (*Paradoxurus*), also found in the Oriental Region, but not in Africa.

There is only one genus of the Insectivora confined to this region (*Potamogale*), already alluded to as being allied to the Madagascan *Geogale*. This much modified form is one of the few members of the Insectivora that has adopted aquatic habits. It is, for a member of the order, of considerable size.

The bats of West Africa, as is usually the case in every land, belong mostly to widespread forms. Out of sixteen genera only two, each containing a single species, are confined to this subregion, while a third (*Epomophorus*) has not been found outside Africa. These three genera all belong to the family *Pteropodidæ*, containing the large fruit-eating bats. A few species of lemurs still survive in the forests of the West African Subregion. They belong to two genera, neither of which are represented in Madagascar. Of these, one (*Galago*) is also found in the

other parts of Africa; the other (*Perodicticus*), containing two species, is met with only in the West African Subregion.

The forests of West Africa are plentifully supplied with monkeys. Most of these belong to the genus *Cercopithecus*, of which, out of about forty species, thirty are met with in West Africa. Another genus, *Cercocebus*, contains four species, all confined to this subregion.

Finally, it is only in these pathless and luxuriant jungles that two man-like apes, the chimpanzee and the gorilla, are to be met with. The gorilla seems to be confined to the Gaboon district, but the chimpanzee extends all over the Congo basin up to the shores of Tanganyika.

These two, together with the ourangs and the gibbons of the Oriental Region, make up the family *Simiidæ*, which in structure is the most closely allied to man of all the Primates.

On comparing the West African fauna with that of the rest of Africa, it will be seen that it is characterized by the exclusive presence of the following forms:—

1. *Hyomoschus* (the water-chevrotain), which, together with *Tragulus* of the Oriental Region, forms the family of *Tragulidæ* of the Ungulata.

2. Two genera (*Malacomys* and *Deomys*) of the family *Muridæ*, and *Atherura* (brush-tailed porcupine), found elsewhere only in the Oriental Region, among the rodents.

3. Two genera (*Poiana* and *Nandinia*) of the family *Viverridæ*, among the Carnivora.

4. *Potamogale*, among the Insectivora.

5. Two genera of fruit-eating bats (*Leiponyx* and *Trygenycteris*).

6. *Perodicticus*, a genus of lemurs, and *Cercocebus*, *Gorilla*, and *Anthropopithecus*, among the higher monkeys.

The West African Region is further characterized by the absence of the following families, well represented in other parts of Africa: *Orycteropodidæ* (aardvark), *Giraffidæ* (giraffes), *Equidæ* (zebras and wild asses), *Rhinocerotidæ* (rhinoceroses), and *Leporidæ* (hares).

The following table shows the number of genera in each order and their distribution:—

	Edentata.	Ungulata.	Rodentia.	Carnivora.	Insectivora.	Chiroptera.	Primates.	Total
Endemic	0	1	2	2	1	2	4	12
African	0	11	10	2	0	1	4	28
Cosmopolitan	1	6	8	9	3	13	0	40
Total	1	18	20	13	4	16	8	80

SECT. 6.—THE CAPE SUBREGION.

This subregion, when extended so as to include the whole country as far north as Angola on the west, and up to the Tana river on the east, is on the whole, after the Malagasy, the most distinct of the four subregions, since it possesses nineteen endemic genera out of a total of ninety-one. Furthermore, it contains a greater range of temperature and humidity than the other subregions, for, while in Natal and Mozambique tropical forest conditions prevail, giving the fauna a certain resemblance to that of West Africa, in Cape Colony itself a temperate and fairly dry climate is found. Again, in Namaqua-land, to the north-west of Cape Colony, we meet with an open, dry, hot, desert country, the conditions of which closely

approximate to those of the Saharan Subregion. The distinctness of this subregion, apart from the mammals, is strongly marked by a very remarkable flora, as well as by the exclusive possession of many forms among the other orders and classes of the animal kingdom. Among the Edentata, besides the scaly anteater (*Manis*), of which one species extends as far south-east as the Transvaal, there is also found the aardvark (*Orycteropus*), an animal characteristic of South Africa, though also occurring in East Africa as far north as the upper Nile basin. The relationships of this creature are very obscure, but the recent discovery of remains of a closely allied fossil form in beds of lower Pliocene age in the island of Samos, in the Ægean Sea, shows that the aardvark, like so many other African animals, has migrated southwards from the Palæarctic Region.

The greater number of the genera to which the numerous antelopes of the Cape Subregion belong, extend northwards into the Saharan and even into the West African Subregion, although the species of the Cape Subregion are in many cases distinct.

Among the distinct species may be mentioned the hartebeeste (*Bubalis caama*), the spring-bok (*Gazella euchore*), and the sable antelope (*Hippotragus niger*). The two gnus (*Connochætes*) and the pallah (*Æpyceros*) are confined to this Subregion. To the portion of this Subregion south of the Zambesi are restricted two of the African horses, the quagga (*Equus quagga*), now said to be extinct, and the mountain zebra (*Equus zebra*), which is fast approaching the same condition. But Burchell's zebra (*Equus burchelli*), under various slight modifications, occurs in suitable localities throughout the whole subregion.

The so-called white rhinoceros (*Rhinoceros simus*), which is now only existing in two small districts of Mashonaland and Zululand, was formerly abundant in the Cape Colony and the Transvaal, but has never been met with north of the Zambesi.

Five out of the eighteen genera of rodents found in this subregion are endemic. Two of these belong to the mouse family (*Muridæ*), and two more to a burrowing family (*Spalacidæ*); the fifth (*Petromys*) belongs to the family *Octodontidæ*, which the Ethiopian shares with the Neotropical Region.

The South African Subregion, however, is especially remarkable for the large number of peculiar genera of Carnivora. Five of these genera have been formed for the reception of a number of small animals allied to the Indian mongoose. Another, for which a separate family has been created, contains only the aardwolf (*Proteles*), an animal nearly allied to the hyenas, but with very small, almost rudimentary teeth, and a heavy mane of long hair. It is nocturnal, and feeds principally on carrion, being too weak to attack other living animals. The *Otocyon*, or Cape hunting-dog, which constitutes another peculiar genus, is remarkable for having a greater number of molar teeth than any other mammal. Owing to this, it has been regarded by Professor Huxley as the most primitive of all existing members of its family. Out of the six genera of Insectivora found in this subregion three are endemic. Of these the most interesting is the genus *Chrysochloris*, which forms a distinct family, and comprises no less than eight species. These animals are sometimes known as "golden moles," owing to the brilliant metallic lustre of their fur. They are in some respects allied to the *Centetidæ*, a family mentioned above as confined to Madagascar; but they are modified for a burrowing life, and externally resemble the moles. Neither of the two remaining orders, the bats and the monkeys, is represented by peculiar genera in the Cape Subregion. This, however, is quite what one would expect, as members of these two orders are essentially forest-loving in their habits, and this subregion consists chiefly of sparsely wooded and arid districts.

On the whole, therefore, the Cape Subregion will be found to be characterized,

as compared with other parts of Africa, by the exclusive possession of the following forms :—

1. *Connochætes* (the gnus), *Pelea* (the rhébok), and *Æpyceros* (the pallahs) among the antelopes.

2. *Pachyuromys* and *Mystromys*, genera of *Muridæ*; *Bathyergus* and *Myoscalops*, genera of the burrowing *Spalacidæ*; *Petromys* of the *Octodontidæ*, among the rodents.

3. Five genera of mongooses, belonging to the family of *Viverridæ*; *Proteles*, the only representative of the family *Protelidæ*; *Otocyon* (the Cape hunting-dog); and *Pœcilogale* (a small weasel), among the Carnivora.

4. *Rhynchocyon*, of the *Macroscelidæ*; *Myosorex* (a shrew); and the *Chrysochloridæ* (golden moles), among the Insectivora.

The following table, showing the distribution of South African genera, is constructed on the same plan as that of the other subregions.

	Edentata.	Ungulata.	Rodentia.	Carnivora.	Insectivora.	Chiroptera.	Primates.	Total.
Endemic	0	3	5	8	3	0	0	19
African	1	15	6	3	0	2	4	31
Cosmopolitan	1	8	7	9	3	13	0	41
Total	2	26	18	20	6	15	4	91

Sect. 7.—The Saharan Subregion.

The Saharan Subregion, as its name implies, is essentially a dry and desert district. As here regarded, in addition to the Sahara proper, it includes the southern part of Arabia and Somaliland, both of which are distinctly arid countries. The only part of the subregion where there is much rainfall is in the Abyssinian highlands and the country surrounding such isolated mountains as Kenia. In consequence of these facts, and also in accordance with the fact that the subregion is conterminous for so long a distance with the Palæarctic Region, the number of endemic genera of the Saharan Subregion is extremely small, being only seven out of a total of eighty-five—that is, 8% as compared with 21% in the South African, and 15% in the West African Subregion.

Of recent years a considerable number of new forms, especially of antelopes, have been obtained from Somaliland, a country which, up to a few years ago, was quite unknown, and it is quite possible that eventually the "unknown Horn of Africa" will be found to possess a fauna sufficiently distinct from the rest of the continent to be separated as another subregion. But for the present, until our knowledge is widened a little more, it will be best to keep Somaliland in the Saharan Subregion.

The most characteristic feature of the subregion is, perhaps, the large numbers of antelopes. These, as a rule, are specifically distinct from those of the Cape Subregion. Among them may be mentioned Swayne's hartebeste (*Bubalis swaynei*), Hunter's bontebok (*Damaliscus hunteri*), three species of *Oryx* (*O. beisa* from Abyssinia and Somaliland, *O. beatrix* from Arabia, and *O. leucoryx* extending from Senegal to Nubia), and a distinct species of kudu (*Strepsiceros imberbis*), which inhabits the subregion from Somaliland as far south as the Tana. This subregion is also the head-quarters, too, of the gazelles, at least twelve species out of a total of twenty-three being found there.

Three genera of antelopes are endemic; these are the dibatag (*Ammodorcas*

clarkei), and the gerénuk (*Lithocranius walleri*), both found in Somaliland, and remarkable for their very long necks, by means of which they are enabled to reach down branches of trees from a considerable height. The head and way of feeding of both these gazelles are giraffe-like, as has been described by Captain Swayne.

The third is the addax antelope, which is found throughout the Sahara, and extends into Arabia.

The rodents are well represented in this subregion, but there are only three peculiar genera—*Lophiomys*, *Heterocephalus*, and *Pectinator*.

Lophiomys, a curious crusted rodent, is mentioned above, and forms a distinct family.

The remarkable little animal *Heterocephalus* is almost entirely hairless, and apparently lives underneath the ground, burrowing in the soft sandy soil of the desert. It was originally obtained by the celebrated traveller Rüppell in Abyssinia, and has since been brought from the interior of Somaliland by Mr. Lort Phillips.

The third endemic genus, *Pectinator*, is also from the coast of Somaliland and Abyssinia. It was first obtained by Captain Speke, and named by Blyth after its discoverer.

The Saharan representatives of the Carnivora, Insectivora, and bats are almost all widespread forms, and present no features of special interest. Among the monkeys, however, we find one peculiar genus—this is *Theropithecus*, containing two species of terrestrial baboons, which inhabit Abyssinia and the Galla country.

The other genera of African monkeys are fairly represented here, though by no means so abundantly as in the West African Subregion.

The Saharan Subregion, therefore, is characterized by the exclusive possession of the following genera :—

(1) *Ammodorcas*, *Lithocranius*, and *Addax* among the antelopes.

(2) *Lophiomys* (forming a distinct family), *Heterocephalus*, and *Pectinator* among the rodents.

(3) *Theropithecus* among the Primates.

The following families, found in other parts of Africa, are absent from this subregion : *Tragulidæ* (chevrotains), *Protelidæ* (aardwolf), *Potamogalidæ* (river-shrews), *Centetidæ* (tenrecs), *Chrysochloridæ* (golden moles), *Chiromyidæ* (aye-ayes), and *Simiidæ* (the anthropoid apes).

The following is the summary of the mammals inhabiting the Saharan Subregion :—

	Edentata.	Ungulata	Rodentia.	Carnivora.	Insectivora.	Chiroptera.	Primates.	Total.
Endemic	0	3	3	0	0	0	1	7
African	1	15	8	3	0	1	4	32
Cosmopolitan	1	9	12	7	3	14	0	46
Total	2	27	23	10	3	15	5	85

Sect. 8.—Past History of the Ethiopian Region.

Up to the present time palæontology has afforded us little assistance in tracing out the past history of the African mammal-fauna. With the exception of a few still surviving species found in a semi-fossil condition in caves, the only fossil mammal hitherto obtained from the Ethiopian Region is a form named by Owen *Tritylodon*, the remains of which were discovered in the Karoo beds of Basutoland, in South Africa. This formation is of Mesozoic age, and seems to correspond to the

Trias of Europe. Near Stuttgart, also, in beds of the Trias age, another specimen closely resembling that of South Africa has been obtained. *Tritylodon* belongs to a group which was apparently allied to the modern marsupials, and many somewhat similar forms have been found in other Mesozoic beds in Europe and North America.

The only conclusion to be drawn from this is, that before the commencement of the Tertiary epoch the whole world was, so far as is at present known, inhabited by small insignificant mammals distantly allied to the marsupials, which at present are restricted to Australia and South America. Besides *Tritylodon*, the only fossil mammals hitherto known, from the Ethiopian Region, are those which have been described by Grandidier (3) and Forsyth-Major (4) from Madagascar, as mentioned above.

The resemblances between the faunas of the Oriental and Ethiopian Regions have been noted and commented on by many writers; Mr. Allen is even disposed to join the two regions into one realm. The number of prevailing genera, however, common to these two regions, and not found in the Palæarctic Region, is very small, the total being, as was pointed out in the first article of this series, only eight, and of these one (*Mellivora*) has since then been recorded by Büchner (2) as occurring in the Trans-Caspian district, and is therefore also Palæarctic. Of the other seven, four have been found, in a fossil state, in various parts of the Palæarctic Region. These are—(1) *Manis* (the scaly anteater), from the Pliocene of Samos; (2) *Rhinoceros*, which existed in various parts of Europe from Miocene up to Pleistocene times; (3) *Elephas*, which first appears in Pliocene times, and extends to late Pleistocene in Europe; and (4) *Viverra*, which commences earlier than the others, and also survived until Pliocene times in Europe. The three remaining genera common to India and Africa, but not hitherto found in fossil state in the Palæarctic Region, are—*Golunda* (a rat), *Atherura* (brush-tailed porcupine), and *Nycteris* (a small insectivorous bat).

It is quite possible that these animals may eventually be discovered in the European Tertiaries. Besides this, the remains of a considerable number of the now endemic African genera have been found fossil in Europe. The list of these is instructive, and points almost unquestionably to the conclusion that Africa has been gradually peopled by successive inroads of animals from the North.

In the Eocene beds of Europe the still existing genera are few in number; but the lemurs, and many of the more primitive forms of the Carnivora, such as form the present fauna of Madagascar, abound. It is, therefore, probable that the separation of Madagascar from the mainland of Africa took place at about the close of the Eocene period. During the Miocene and lower Pliocene times in Europe, a large number of new genera appear for the first time, the bulk of which still survive in Africa and India, though extinct or almost driven out of the Palæarctic Region.

Examples of such genera are—*Orycteropus*, the ardvaark; *Manis*, the scaly anteater; *Rhinoceros*; *Hyomoschus*, the water chevrotain (probably identical with *Dorcotherium*, a fossil form); *Giraffa*; several genera of Antelope; the Porcupine; the Squirrel; *Felis*; *Hyena*; *Viverra*; *Herpestes* and even the higher Monkeys.

It must have been during this period that broad land-connections existed between Europe and Africa, by means of which the Dark Continent became peopled by its present fauna.

In the succeeding Pliocene times in Europe, although a number of the more distinctly African forms still survive, there begin to appear certain genera, such as those of the deer family (*Cervidæ*), *Ursus*, the bear, and others which have never reached Africa at all. This seems to show that Africa was, at the commencement

of this period, cut off from the Palæarctic Region by a sea occupying approximately the Saharan desert of to-day.

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(4) Major, C. I. Forsyth—"On Megaladapis madagascariensis, an extinct gigantic lemuroid." *Proc. Roy. Soc.*, 1893, p. 176.

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THE MARSHALL ISLANDS.*

By Dr. STEINBACH.

The Marshall group consists of two nearly parallel series of islands, running from N.N.W. to S.S.E., which are named by the natives Ratak ("Islands towards the Dawn") and Relik ("Islands towards the Sunset"). Of a sea-area larger than Germany, about 176 square miles, according to Dr. Steinbach's estimate, are occupied by the thirty-four islands. All are of coral, and most are atolls, though there are a few single islands also. Existing maps are still very incomplete, especially as regards the atoll Arno. In connection with the theory of the formation of coral islands, it is noteworthy that the side of the Atolls which is exposed to the prevailing wind, and therefore to the heaviest surf, has always the greatest number of islets. The number of these in the separate atolls varies greatly, as does the size of the latter. The height of the islets rarely exceeds 3 to 12 feet, but in a few places, as, *e.g.*, on Ligieb, dune-formations of coral sand rise to a height of 40 feet.

Of the Relik group the most important are Yaluit (the seat of government). Ebon, and Namvik. The second of these is the most southern of the group, and possesses a fairly thick layer of *humus*, supporting a rich vegetation. It was formerly the seat of the Hawaiian Mission, and has about 1000 inhabitants. In the Ratak group, Mejem has a population of about 1200, and (in part) a well-tilled and fertile soil. Eastward of it lies the atoll Arno, likewise fairly well peopled and fertile, while the atolls Milli, Aur, and Maloelap are also noted for good cultivation and luxuriant growth of trees. Since 1877 extensive plantations of cocoanuts have been made on Ligiep, in the north, the half-caste inhabitants of which possess good boats and even small ships. The most northern islets are inhabited by large colonies of sea-birds, but the guano has not proved worth exploiting. They are only visited occasionally in quest of turtle and the feathers of the frigate-bird.

The climate of the Marshall islands is, for a tropical climate, comparatively favourable to Europeans. They are free from swamps, but the continued high

* Abstract of paper read at the Berlin Geographical Society, June 8, 1895.

temperature and the moisture of the air render them dangerous for Europeans with heart or lung affections. Besides heart and kidney disease, dysentery and rheumatism (both of the muscles and joints) are not uncommon. Observations extending over three years gave the mean temperature as 80·6° Fahr., the extremes being 93° and 71°, but the difference between the means for the hottest and coldest months (*i.e.* January or February and July or September) only about 1·5°. The rainfall is pretty evenly distributed through the year, and is quite excessive (177 inches). It is only in January and February that a comparatively dry period can be expected. A cloudy sky is frequent, and the number of really hot days only about six in the year. The north-east trades blow from December to April, becoming rather easterly or south-easterly from March to November. Calms or violent south-westerly storms occur chiefly between August and November. There being no springs, a supply of water is collected in tanks or cisterns. The useful plants include the coconut palm, bread-fruit tree, and *Pandanus odoratissimus*, the sap of which last is rich in sugar. The cultivation of plantains has much increased of late, besides which several kinds of arums, the South Sea arrowroot (*Tacca pinnatifida*), and a mangrove which supplies a black dye, are grown. Some European vegetables thrive, and guavas, figs, citrons, and anonas do well; but tea, coffee, cacao, etc., cannot be grown at all.

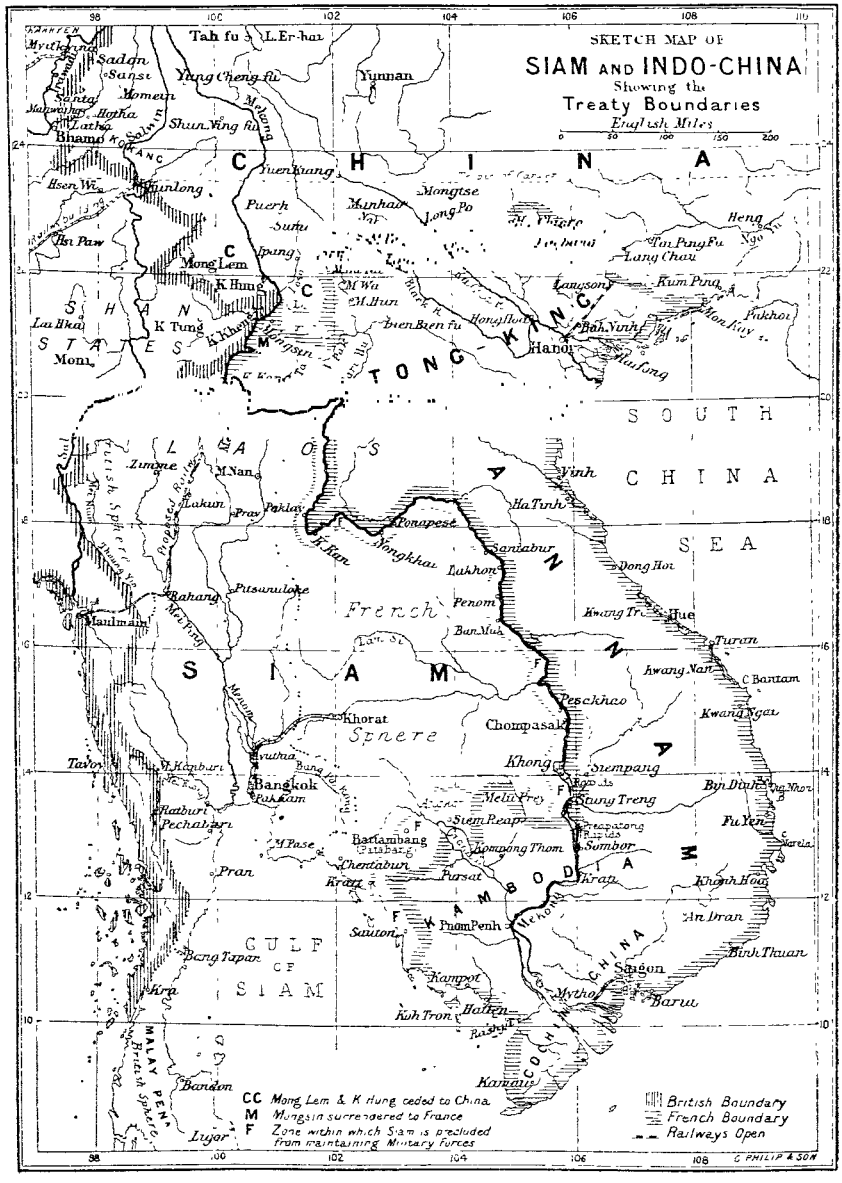
The Micronesian population amounts to from 12,000 to 13,000, and no decrease appears to take place, the northern islands having decidedly more inhabitants than in Chamisso's time. A census taken on Nauru in 1891 and 1893 showed the surprising rate of increase of fifteen per thousand per annum. The density is also fairly high, being sixty-eight to the square mile. A physical deterioration of the race seems due to the prevalence of syphilis, by which fifty per cent. of the inhabitants are attacked. The population belongs to four sharply defined classes. The great mass consists of the common people ("Kayur"). The next higher class is that of the "Leataketak," comparable to village magistrates in Germany, who see that the orders of the chiefs are carried out. Neither of these classes owns land, but they are allowed to grow as much produce or catch as much fish as is necessary for their sustenance. They have to perform certain services for the chiefs, such as the cutting of *copra*. The ordinary chiefs, "Burak," rank above both these classes, and they often possess larger holdings than the "Iroj," or head chiefs. All the members of these four classes acquire their rank through the mother only. The son of a woman of the Iroj class is always an Iroj, even though the father be a common "Kayur." The power and dignity of the chiefs is still considerable, and the judicial observance of the people still gives them the power of life and death.

BOUNDARY TREATIES IN SIAM AND INDO-CHINA.

THE boundary disputes along the Chinese frontier, and more especially on the Upper Mekong, arose out of the conquest of Upper Burma by Great Britain in 1885, and the expansive colonial policy of the French in Indo-China. They were complicated by the fact that some of the Shan states paid tribute both to Burma and to Siam, and that their boundaries had never been accurately defined.

France may be said to have set the ball rolling by presenting, on July 20, 1893, an ultimatum at Bangkok, in which she claimed the surrender of the whole of the Siamese territories lying to the east of the Mekong, as far as the Chinese frontier. Siam after a time conceded all that was demanded. By the treaty of October 30 (November 25), 1893, France secured the whole of the territory to the

east of the river named. Siam undertook to maintain no armed boats on the river or on the Grand lake, to withdraw her garrisons or military establishments from the provinces of Battambang and Siem Reap, and from within a zone 25 kilomètres



(15·5 miles) broad, extending along the right bank of the Mekong. France, moreover, was authorized, in the interests of navigation and of commerce, to establish coaling-stations on the right bank of the river, and to appoint consuls to Khorat, Muang Nan, and other places.

The area of the districts within which the authority of the King of Siam is curtailed in this manner amounts to 20,000 square miles.

The claim advanced by France on the strength of this treaty brought her into conflict with British claims on the Upper Mekong. After futile discussions, the governments concerned, on November 25, 1893, agreed to the creation of a neutral zone or "buffer state" on the Upper Mekong; but when it became evident that no settlement could be arrived at in this way, fresh negotiations were entered upon, and these resulted in a "Declaration" signed at London on January 15, 1896. This "declaration" should be interpreted in the light of the notes of Lord Salisbury and Baron A. de Courcel which accompany it, and it will then be seen that Siam has not been dismembered, as was at first supposed, but that the arrangements made are intended to promote the "security and stability of the kingdom of Siam."

Siam henceforth occupies a unique position among independent states.

Its central section (84,600 square miles) includes the basins of all rivers which drain into the Gulf of Siam from Bang Tapan to Pase, as also the territory to the north of the basin of the Menam, and situated between the Anglo-Siamese frontier, the Mekong, and the eastern watershed of the Me Ing. Within this, the most populous and productive portion of Siam, the two powers undertake "that they will not operate by their military forces, except so far as they may do it in concert for any purpose that may be required for maintaining the independence of Siam." Nor will they seek to acquire within that area any privileges or commercial facilities which are not extended to both of them.

As to the remainder of Siam, the rights of the king are carefully guarded, but no such limitations, as above described, are imposed upon the contracting powers with respect to them. France not only retains the 25-kilomètre belt along the Mekong, and other privileges secured by her treaty with Siam, but the whole of the eastern portion of the kingdom, including Khorat (80,100 square miles), is assigned to her as a sphere of independent action; whilst Great Britain enjoys a similar freedom with respect to the Siamese territories lying to the west. These include a portion of the basin of the Salwin (8800 square miles), and the whole of the Siamese portion of the Malay peninsula to the south of Bang Tapan (45,500 square miles).

Mongsin (1600 square miles), which was occupied by British troops in May last as a portion of the Kiang Kheng states, has been surrendered to France, and the Mekong henceforth forms the boundary between the British Shan states and French Indo-China.

The other treaty boundaries shown on the accompanying map are as follows:—

1. The Anglo-Siamese boundary, according to the treaty of October 3, 1893.

2. The Anglo-Chinese boundary, according to the treaty of March 1, 1894. By this treaty the Shan states of Mong Lem and Kiang Hung were ceded to China, but the cession was made conditional upon China not surrendering these states to a third party. This was supplemented by a convention signed at Tientsin on September 6, 1894, which provides for a junction of the Burmese and Chinese lines of telegraph between Bhamo and Momein.

3. The boundary between China and Tongking, as defined in the convention of June 20, 1895. By this arrangement China surrendered Muang Hu and Muang Hu Tai, which were at least nominally portions of the state of Kiang Hung. France secured also important commercial advantages by this convention. Lung-chau, Sumao, and Hoi-hau (near Mongtse) are opened to foreign commerce; the Mekong and its tributary the Loso are opened to navigation; provisions are made for the extension of railways and telegraphs; and the mines in Kwang-tung, Kwang-si, and Yun-nan are thrown open to French enterprise—not, however, to the exclusion of other nationalities.

FROM YUN-NAN TO BRITISH INDIA.

By PRINCE HENRY OF ORLEANS.

[By the courtesy of M. Maunoir, the Secretary of the Paris Geographical Society, we have received an advance proof of the communication addressed to that Society by Prince Henry of Orleans, on his recent remarkable journey from Talifu (Yun-nan) to Sadiya (British India).]

About the middle of June (1895) we left Talifu, our object being to continue the exploration of the Mekong.

During our stay at Tali we were able to rearrange our caravan. We have an excellent head muleteer, a serious man, from whose mouth we never heard an oath or a complaint (a rare thing in China). Our interpreter is a Christian of twenty-eight years, a Chinese, with whom we converse in Latin. To say that to listen to us would not have grated on the ears of Cicero would be an absurd pretension; but dog-Latin or not, we understand one another, and that is the principal thing. Joseph—that is the name of the interpreter—is a devoted man, for whose services we have constantly had to be thankful. Some *mafus* completed the party, and our two Annamites continued to follow us. We struck out in a westerly direction. Two passes, one of which is over 3000 mètres (9843 feet), but of easy access, having been crossed, we arrived at Yunlong-Chu. From thence to Feilong-Kiao, where the Mekong was crossed upon a fine bridge, the last in the north until arriving at Chiamdo.

At Feilong-Kiao the people told us that there was only a route upon the left bank; that the right bank was impossible for mules to follow, and also that it was inhabited by savage and independent tribes. This was tempting for us. They told us of an attractive route leading to Lao, a village three days from Feilong-Kiao upon the right bank. Let us go as far as Lao; this will be so much gained, and we shall easily see if we can continue.

Starting again, we marched stage by stage, advancing, thanks to the more or less correct information, as far as the valley of the Salwin. Before reaching this valley we were already obliged to adopt those methods of travelling which, as far as Tseku, tended to render our march very slow. Our men were obliged to transform themselves into road-menders. Each day it was necessary to unload the baggage and to work at the road. We considered ourselves fortunate when this operation was not renewed more than twice a day. The chief muleteer in front, pick in hand, directed the work, which was very trying, and from our old party we should never have expected the exertions now put forth by our men. The track repaired or made, they led the mules, but to add to our misfortune, we had a period of rain, the ground was slippery, and the animals kept their footing with difficulty, and frequently fell. I remember, among others, one day, when at the same place, we saw five mules with their loads fall in succession from a height of 30 mètres (98 feet). It was necessary that everybody should set to work to raise the pack-saddles, to rearrange and fasten them on again, then to lead the animals, which after these formidable falls we found tranquilly browsing at the bottom of the ravine, as if they were made of indiarubber. All this work in a pelting rain. There were still some hours of marching in order to reach the hut where we were to spend the night, every one being continually obliged to pick up the fallen loads; then the caravan separated into many parts, one of which mistook the road. I pitied our men. Really this was too much "guigne." It was enough (pardon the vulgar word, which expresses the thing well) to make one savage. At the first

village after these hard days some men left us, but we were able to replace them by natives.

[The want of precise information made them take fifteen days to reach, upon the right bank of the Mekong, a point which is only two days to the north of Feilong-Kiao; but they were thus able to follow up the left bank of the Salwin for several days.]

On July 9 we were again on the right bank of the Mekong, which we followed as far as Into, reaching this place on August 11. I cannot say that the route is practicable for mules. We got through, and that is all. Besides the daily work of filling up or widening the track in the line of march, we were on certain days completely stopped, while one party of our men made a path through loose soil, which kept crumbling down into the river. Mules are good mountaineers, and have the advantage of not being given to dizziness, otherwise we doubtless should not have preserved one. One day one of our animals fell into the river. By chance the men were able to stop the load (two of our trunks) before it reached the water, but the animal itself, carried away by the current, crossed the river and landed lower down on the left bank. Some villagers were able to chase it and send it back to us by the same way.

During this part of the journey along the right bank of the Mekong, we passed through some very interesting tribes—Lamajen and Lissus. Advancing but slowly, and sleeping almost every night in one of their villages, we were enabled to see them very closely, to be present at their dances, and gather interesting particulars concerning their manners.

[These tribes, who appeared rather timid, made no difficulty about the travellers proceeding; but one evening they had to take up their arms to repulse an attack which appeared to be imminent. The Lissu villagers were frightened, and wished to massacre them, but during the night everything quieted down.]

The Lissus and Lamajen on the Mekong are very timid. The unfortunate people are continually the victims of the incursions of the independent Lissus of the Salwin, who are dangerous brigands. In nearly every village we were told of a band which had come from the other side of the mountain two or three days previously, and had taken away cattle, and even some men, who, if not ransomed by their friends, would be reduced to slavery. I asked the villagers why they did not do the same to their enemies, and in their turn go and pillage them. The answer was, "They are stronger and better armed than we are." To this reply there was nothing to say.

[Generally the travellers were well received; sometimes the Lissu bards, accompanying themselves on a guitar, sang impromptu songs in honour of the "great men" come from afar. This part of the journey passed off well, except that Lieut. Roux had to deplore the loss of his theodolite and his hypsometer.]

At Into we were opposite Hsiao-Wei-si, where a French missionary resides, Father Tinlet, whom I had already had the pleasure of meeting at Szu-Chuan, whilst on my journey with M. Bonvalot. He told me that we could not go as far as Tseku with the animals, as, before reaching that locality, there are perpendicular rocks which we could not pass over with the caravan, even though we carried out our usual operations. Two days above Into we were, therefore, obliged to cross the Mekong—a dangerous passage in small canoes, shot through the middle of the rapids. We got over, however, without accident.

On August 19 we recrossed the Mekong by a rope bridge, upon which men and animals slid in turns, attached to a small wooden seat, and thus arrived at Tseku.

Tseku, a station of the Tibetan mission, is inhabited by two missionaries,

from whom we received the most hearty welcome possible. Although under the jurisdiction of Yun-nan, we were in the country of the Tibetan tongue. Some days previously we had finished the exploration of the Mekong in China.

Beyond this point, the course of this river has been laid down by Messrs. Cooper, Gill and Mesny, Count Széchenyi, the Pundit A. K., and the missionaries, as far as Chiamdo. To the north of this point, M. Bonvalot and I, and Rockhill have crossed it. In order that the course may be entirely known, it only remains to survey one part of it from the other side, from the Degue up to its sources. We had, therefore, finished our mission, strictly speaking, and accomplished the object which we had planned. The thing was to return.

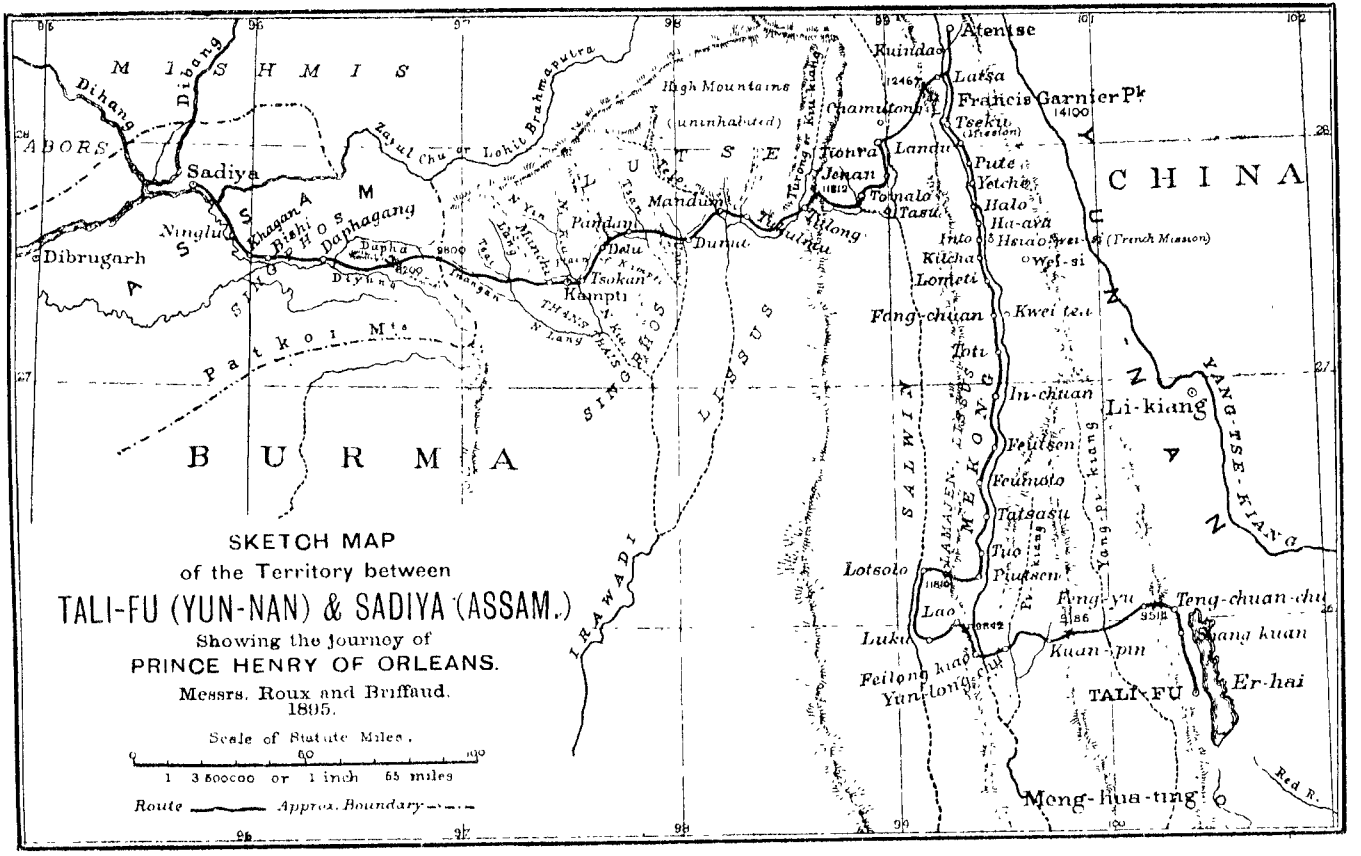
[The stay at Tseku was prolonged, the Prince of Orleans having taken fever and neuralgia. During the leisure time of his convalescence, whilst Lieut. Roux pushed forward as far as Atentse, in order to fix a point astronomically for the end of the journey, he gathered, with the aid of the missionaries, a great deal of information about the Tibetans, the Lissus, and the Massas of this region. He obtained from these latter some books of sorcerers' prayers, written in hieroglyphics, and made them translate them in his presence, which he believes had not previously been done. Various considerations made the travellers give up the idea of going to the province of Sarong, their goal now being India, which they tried to reach by the most direct route possible.]

We endeavoured to find our nearest possible way to the Zayul Chu, in order to seek to settle definitely the problem of the Salwin and the Irawadi by crossing the upper branches of the latter near their source. It was with this object that, on September 10, we left Tseku. We had sent back to Talifu the greater number of our mules, with all our Chinese muleteers, our collections, and all that was not absolutely necessary to us (by the great route *viâ* Wei-si and Likiang). We only retained what was strictly necessary, and about fifteen mules. Beside our interpreter Joseph, two Chinese, and the Annamites, our party comprised twenty-six men of Tseku or its environs. These are people dressed in the Tibetan style, and speaking Tibetan among themselves; but most of the people one finds around Tseku, being a mixture of different races, are polyglots. Nearly all speak Chinese; some the Mosso, the Lutse, and the Lissu. The greater number are Christians. These men will act as porters and *mafus* at the same time. They engaged to follow us wherever we should desire, and as long as we should wish. We, on our part, engaged to send them back to their own country by the way that to us should appear the easiest and least dangerous.

[But the travellers have little information: beyond the Salwin there is a great river called Kiukiang, the paths are very bad, the inhabitants are savages and live on trees. This is all that they could learn about this country, which separates China from India.]

From September 10 to 19, we passed from the valley of the Mekong into that of the Salwin. The pass is high, 3800 mètres (12,467 feet). A lofty peak which commands it received from us the name of Francis Garnier. During this time it rained almost continually. The animals were worn out, and it was necessary to make nearly all the journey on foot. We were still in a country comparatively well known. Some missionaries have come into these parts bordering on the Salwin. We found ourselves in the midst of the Lutse people, who received us very well. The crossing of the river was easily accomplished in small canoes. We were between the lamasery of Chamutong, from which presents were sent to us, and Tasu, where Father Dubernard used to be.

A range with a pass of 3600 mètres (11,812 feet) rises between the Salwin and an affluent to the right of it. It would have necessitated a long detour for us to


SKETCH MAP
of the Territory between
TALI-FU (YUN-NAN) & SADIYA (ASSAM.)
Showing the Journey of
PRINCE HENRY OF ORLEANS.
Messrs. Roux and Briffaud.
1895.
Scale of Statute Miles.
1 3 500000 or 1 inch 55 miles
Route
Approx. Boundary
BURMA
CHINA
MISHMIS
ABORS
Sadiya
Dibrugarh
Dibang
Lohit Brahmaputra
Zayul Chu
Patkoi Mts
Ninglu
Daphagang
Bishi
Daphla
Diyun
Pandam
Datu
Tsokan
Kampti
Mandura
Duma
Tsonra
Johan
Tsamutong
Kuindao
Atentse
Latsa
Francis Garnier Pk
14100
Tseku
Landu
Pute
Yetche
Halo
Ha-ava
Into
Hsiao Kwei-si (French Mission)
Wei-si
Kiccha
Lometi
Tonalo
Tasu
Fang-chuan
Kwei te
Tetu
In-chuan
Li-kiang
Yang-tse-kiang
Feutson
Feutsolo
Tatsasu
Tuo
Piuasen
Lotsolo
Lao
Luku
Feilong kiao
Yun-long-chu
Kuan-pin
Feng-yu
Teng-chuan-chu
Yang kuan
Er-hai
TALI-FU
Meng-hua-ting
Red R.
Irawadi
Salwin
Mekong
Lisus
Singhos
Thans
High Mountains
(uninhabited)

endeavour to find where this stream joins the main river, and we should have been obliged to cross the mountain. At the foot of this mountain we were compelled to send back the mules to Tseku, in charge of two men. We sent back at the same time some small baggages which were considered to be not absolutely indispensable. We travelled from this time altogether on foot, until the end of December—that is to say, for three months.

In order that it may be more intelligible, I shall divide our journey from the time when we left the mules until our arrival in India into three parts:—

1. From September 22 to November 18, from the valley of the Salwin to the arrival at the plain of Khamti.

2. From November 18 to 25, the stay at Khamti, and the journey across the plain.

3. From November 25 to December 16, from Khamti to the first large village of Assam.

1. *From the Salwin to Khamti.*

The country through which we passed after parting with the mules as far as the plain of Khamti, very rugged, although its general aspect is uniform. There is nothing but steep mountains, covered with forests, and at the base of which are swollen torrents or small rivers of clear icy water. Of roads there are, correctly speaking, none. We scaled the sides of the mountains on all fours, using our hands as much as our feet, catching hold of roots as well as we could when we found them. We cleared the rocks, supporting ourselves by the least rugged of them; when the rock was too high, the few who pass by had raised against it the notched trunk of a tree, which was to serve as a ladder. The torrents are crossed on bamboo bridges, upon which one is suspended in a sort of hoop, helping one's self across with the feet or hands; or else a bamboo is thrown on the water, upon which it is necessary to balance one's self. When the streams are not too deep, they can be forded. Certain streams are used as means of communication. For two or three days one follows them, jumping from stone to stone, slipping, keeping one's self up with difficulty, and continually falling. During this journey one is never dry, as, when fortunate enough not to fall into the torrent, the rain soaks that part of the clothing which has not reached the water. Villages are few. The nearest are three days from each other. Each village contains only about a dozen scattered huts in different parts of the mountain. The inhabitants are savages, almost naked with the exception of a cloth. We were fortunate enough to find them nice people. Some spoke the dialect which our men understood; and, having had the support of the chiefs in finding some extra porters in the valley of the Salwin, whom we paid well, and who expressed their satisfaction, we were able to change them from village to village, the old ones persuading the new. Thus they gave us a good reputation, and we profited by it.

[But a great difficulty presented itself. How were forty men to be fed in such a poor country? The caravan was for the time in a precarious position.]

Starting from a small village where we had hardly been able to procure enough rice for three days, with the certainty of being unable to obtain anything for the next three days, even by making the stages as long as possible, we arrived one evening at the banks of a torrent which ran into a river whose right bank we were following. There was a rope-bridge across the stream, but the water was so high that it was impossible to cross by it; we ran the risk of being half under water, and of being drawn in by the current. The natives told us that they generally crossed it on rafts. But now nobody would attempt to do so; it was

too dangerous. When the waters rise, they told us, no one crossed; they stayed at home. What was to be done? One could not think of turning back, owing to the difficulty in obtaining food. The idea of returning did not delight us. It was impossible to think of crossing the river. To follow up the torrent further would have been very difficult, as there was no path; and since we had only three days' provisions, there was no time to lose. We decided to wait until the next morning, and 'pitched our tent on a heap of pebbles, with our men around us. At the end of an hour we observed that the waters continued to rise, and threatened to swamp us. There was only just time to decamp. It was a dark night, and the rain was pelting; we packed up our baggage and took refuge under a great rock in the wood. The Chinese cook, who hardly ever complained, was in tears. You may imagine what a night we all spent, crouched one against the other under the rock, and, without appearing uneasy, what sort of reflections we each had.

The rain continued. It was impossible to make any arrangements. At daybreak I hardly thought of going to see the condition of the torrent, being persuaded that it could only have increased. While they were philosophically lighting the fire, one of the men cried, "The water has gone down." I could not believe my eyes; it was nevertheless true. By a phenomenon which we had the opportunity of verifying again later on, the level of the water follows a regular movement according to the time of day—low in the morning, and increasing towards the evening. The rain ceased. We were saved! We crossed the rope bridge. It is impossible to imagine our delight when we found ourselves on the right bank. We had got out of a very great difficulty, of which, had the waters remained in the same condition as the night before, I should not have been able to find a solution.

During this part of the journey we had traversed from east to west a part of the basin of the Irawadi. We had crossed and followed for some days one of the two branches which form the river. The passes which we had crossed had been numerous, the highest being as much as 3600 metres (11,812 feet).

2. *The Plain of Khamti.*

For some time the natives had been telling us of a wide plain which they called "Apon," and later "Moanan." They described it as quite a paradise in which every possible want is supplied. It has numerous villages, inhabited by people with black teeth wearing turbans. Each member of our company now pressed on to reach this promised land. They were delighted with the idea of marching on level ground, and obtaining salt; for we had been quite without salt or grease for ten days, and had eaten nothing but rice boiled in water without any seasoning. Still holding to our westerly course, we reached this plain on November 18. It forms the floor of the valley of the Nam-kiu, the western branch of the Irawadi. We were surprised to find in the Khamti country (such is the name of this plain) both Thans and Thaïs speaking the language of their kindred on the banks of the Mekong, and using a character very similar to that which is met with from the Canton river and the Paï country in the centre of Yunnan, as far as the mouth of the Menam.

[Although now in a known region, already visited by English travellers, the explorers find their greatest difficulties only beginning.]

We passed our time in wrangling with the local authorities. The relatives of the king exhibited a rapacity which disgusted us. After receiving very valuable presents, they came to beg rupees of us. The son of the king went so far as to ask for my boots, and yet he prides himself on having been to Calcutta. Whilst maintaining a firm attitude, we were unfortunately obliged to submit to a part

of the demands of the Khamti people, without whose help it would have been impossible to continue our journey. Another difficulty was that of making ourselves understood. This is how we had to manage: we spoke in Latin to Joseph; he spoke in Chinese to one of our Tibetans, Siranseli, formerly a goldminer; Siranseli passed on the communication in Lissu to one of the native porters from the mountains; the porter spoke in his own tongue to a Thaï who understood it; and the last-named repeated the sentence to the Khamti chiefs. These latter seemed to consider their behaviour quite natural, for in the midst of their incessant demands, they smiled most benignly on us, and even indulged in banter.

3. *From Khamti to Assam.*

Having at last come to an agreement with these chiefs, we got ready to start for Assam. Three routes lead thither: one towards the south, not crossing any high mountains, but lengthy and already used by the English; one towards the north in the direction of the Zayul frontier, traversing the dangerous Mishmi country for some days; and a third towards the west, between the two frontiers, passing over numerous mountains, but offering the advantage of being the shortest, and of having never been followed by a European. We therefore decided on this last.

On November 24 we left Khamti for the passage of the mountain range which separates the basins of the Irawadi and the Brahmaputra. This last section of the journey was the most dangerous and the most trying. In addition to the difficulties of the route itself, which resembled those we had already experienced—torrents to be followed or crossed, five successive ridges to be traversed, rocks in the path, and bamboo bridges requiring a steady balance in the passage—we were assailed by a series of obstacles of another class. Each day something unexpected occurred to arrest, or at any rate to retard, our march. We had not been accustomed to so many mischances.

[These difficulties consisted in the discovery that the length of the route had been underestimated, which caused the supplies to run short in a wilderness of forests and mountains; in the desertion of eight porters; and in attacks of fever brought on by the night-mists of the Khamti country. The traveller proceeds:—]

After a few days my companions also were prostrated by fever. Roux was seized with a violent attack, and Brifaud was soon assailed in his turn. My feelings at this time may be imagined, and, in writing the account, I still shudder at the thought of the disaster which nearly overtook our little band.

When my comrades fell ill we had already advanced for eight days, and had almost reached the halfway point. To return was impossible in the state the men were in; a month's halt in an unhealthy neighbourhood would perhaps bring them no nearer recovery. It was impossible to send in search of provisions, and consume our present supplies on the spot, with the chance of getting no more. There was nothing for it but to advance. I therefore divided the column in two, sending the weakest on at once with the natives and the guide, with instructions to mark the route, and, in case of their reaching a village before us, to send us provisions immediately. I decided to wait a day myself, with the strongest of the party, in order to allow my comrades a rest.

The day having passed, Roux still had not the strength to set out. He begged me to start with the second column, giving me a paper certifying that it was at his own urgent request that I proceeded. I left him with two men and twelve days' rations. Whatever it cost me to leave a sick companion thus amongst the mountains, perhaps at eight days' distance from the possibility of replenishing his supplies, I felt that it was my duty to proceed. By staying I should only add one

more to the mouths to be filled, and I might be more useful in hastening forward with all speed and arranging a succour. Briffaud, in spite of his weakness, accompanied me.

Two days later we crossed, by a pass 10,000 feet high, with a little snow on it, the range which separated us from India. The joy of having reached the goal of our journey was damped for me by the anxieties which constantly harassed me. At the foot of the pass we found two men of the advance column, who had stayed to search for an old man, who, in his feeble state, had lost himself during the night. Alas! he had not been found. Tigers abounded, and his fate was sealed. During the night, on a terrace in the midst of the rhododendrons amongst which we were encamped, my men united in a circle, and, turning towards Tseku, fell on their knees and recited long litanies for nearly an hour. The tops of the trees were swayed by squalls from the west, whilst a few half-burnt logs threw a glimmering light on the mournful scene. I have never in my life seen a spectacle so striking or so profoundly sad.

During the succeeding days it was a forced march by long stages. Every one exerted himself to the utmost, knowing well that an advance must be made at all costs. It was a case of fleeing from death. Our provisions were getting low, and yet we were on strict rations. The men took only two meals in the day—three porringers of rice much swelled with water. We were only half a day behind the first column, which we knew to be a little better supplied than ourselves. We therefore sent on two native porters who had remained with us, to endeavour to overtake it. They were to tell those in front to leave us a little rice.

We hold on: we have only one meal more; and then, none at all. We are forced to leave behind two of our sick men, who cannot travel so fast as the rest of us. We will send them rice the moment we have it ourselves. The tent and all our baggage, save the blankets and one or two cooking-utensils, are abandoned. Our march is retarded by continual streams and torrents, through which we have to wade with the water up to the armpits. The men have been marching twenty-four hours without a morsel to eat, when we find a man left by the advance party with a sack of rice. We are saved!

We learnt, moreover, that we were only one day distant from a small village. It was imperative to think at once of the two sick men left behind. I promised a large reward to any one who would carry them succour. An old Tibetan, Jayo, came forward, and started back to bring on his comrades, after supplying them with food. At the first village, inhabited by subject Mishmis, we found the advance party, which, though it started twenty-four hours before us, had only been three hours in advance at the finish. We at once collected all the rice we could, and sent it back with two natives and one of our own people. They would be able to retrace their steps for at least six days, and provision Roux's small column. Provided he had been able to cross the pass, he was safe.

We had succeeded so well in supplying the needs of our comrades in distress in the rear, that we found ourselves with scarcely anything left for our own wants. The people would not sell us any more. With rather less than a day's supply, we set out for the first important village of Assam, Bishi, which we were assured was two days' march distant. We had sent on two natives in advance to this place, to send us back some rice, so that we started without a great deal of anxiety. But, unfortunately, our guide lost his way. He led us astray into the bed of a small torrent, saying that it flowed into the Diyung, and as the latter passed by Bishi, we were sure to find the village. We passed another sad evening, and our poor men seemed this time thoroughly discouraged, and with good reason. The following day after having laboriously cut ourselves a path through woods, we arrived about midday

at a fisherman's hut. We bought some rice and fish, and they showed us the way. A few hours later we met some of the Bishi people, come to meet us with a supply of rice. Henceforth our troubles ceased.

[Bishi is reached on December 16, and its inhabitants prove friendly and very different from those of Khamti. The two sick men and the brave Jayo rejoin the column, but anxiety is still felt about Lieut. Roux. The limited supplies at Bishi make it, however, necessary to advance.]

Early on the 20th I sent on the men to Khagan, remaining at Bishi, with Briffaud and two or three other men, with the intention of starting at midday. It was well that I did wait thus, for as I was writing, at about ten o'clock, Roux's arrival was suddenly announced by the cry of "Lu Tajen" from my men. It was, in fact, my companion with his two porters and those who had been sent back to him with provisions, all safe and sound. His porters had had fever on the way, and subsequently a sudden rise of the Diyung had delayed the little band two whole days. But they arrived at last, and we were all reunited in safety, which was the main point. I reckon December 20, 1895, as one of the happiest days of my life.

We have succeeded, and if our efforts have turned out well, we ought to ascribe a share in the success to the missionaries of Tibet, without whose aid we should never have been able to find followers, and a share to these followers themselves. We found ourselves at the head of a wonderful band of men, physically sound, active, and enduring, and in their moral character, zealous, disinterested, and devoted. Our men, whom we feel a pleasure in taking down to Calcutta with us in order to send them back by Rangoon and Bhamo, are not mere porters in our eyes. They are rather children with whom we live in community of feelings, as with the members of one family. Brave and generous souls! I cannot sufficiently admire them, and they owe much of their good qualities to the wholesome and kindly influence of the French missionaries.

[From Bishi the explorers start together for Sadiya, finding on the way provisions and boats sent by Mr. Needham, the explorer of the Lohit-Brahmaputra in 1884.]

In short, in the midst of our miseries, after the material difficulties which surrounded our journey as far as Khamti, we have had, in the words of the English whom we found near the frontier, a great piece of luck—that of slipping through between the Mishmis to the north and the Singphos to the south. These two peoples, who are constantly at war with the English, if they had done no worse, would certainly not have allowed us to pass.

The first result of our journey from Tseku is the indulgence of a slight feeling of pride. We, Frenchmen, have been the first to traverse the shortest and most direct route from China to India, a route which so many Englishmen have searched for in vain on both frontiers. I hasten to add that it is not practicable for trade.

As to the geographical results, we are also the first to disprove the theory of General Walker by certain evidence. In the map published under his superintendence, in 1894, by the Royal Geographical Society, the Salwin is shown as having its source in the latitude of Chamutong (that is to say, of Tseku), whilst the large stream which rises to the east of Tengri-nor, and traverses part of the inhabited portion of Tibet under the name Urchu, is considered to be the Upper Irawadi. But the Urchu, as we will show, is nothing but the Upper Salwin, which we found as far north as the latitude of Ta-li-fu, and afterwards crossed at that of Chamutong. Between these two points we were able to lay down the course of the Salwin, and the villages which line its banks, by inquiries made each day whilst we were ascending the right bank of the Mekong.

We crossed the upper branches of the Irawadi, and, by means of the information

received and the views we obtained from the various passes which we traversed (we could see very distinctly from some of them the high chain which bounds the south of Zayul, a few days' journey off), we were able to fix, within a few miles, the points whence these branches take their origin. The three main branches which make the Irawadi are, starting from the west, the Kiu-Kiang, the Telo, and the Nam-Kiu. The two former have the greatest volume of water. They are not marked on the maps. The most northern branch, the Kiu-Kiang, comes from no higher latitude than 28° 30′ N.

From Atentse onwards, my companion Roux surveyed the route most carefully with the compass, and was able to take numerous bearings of remarkable peaks. Even when sick and alone among the mountains, he never intermitted his work until he reached a known point. Thanks to the means of verification supplied by the bearings, I do not think the results obtained can be vitiated by any important error. As to our collections, we were scarcely able to make any relating to natural history after Tseku, marching as we did on foot, and being unable to carry much. I left payment at Tseku for some skins of animals which the people promised to send me, and which I think should be interesting.

We were able to do more under the head of ethnography. I have obtained several vocabularies, and copious notes on the hitherto little-known tribes.

During eleven months' journey from Tongking we have worked as far as possible for the honour and profit of our country, and if those at home who take an interest in scientific and commercial questions are satisfied with the results obtained, all our hardships will soon be forgotten, and we shall consider ourselves amply recompensed for our trouble.

BOUNDARIES OF BRITISH GUIANA.

By CLEMENTS R. MARKHAM, C.B., F.R.S.

(*Postscript to Article on page* 277.)

It is important to explain the mistake about the first and second Schomburgk Lines. In reality there is one Schomburgk Line only. In 1840 Schomburgk published a small volume entitled 'Description of British Guiana,' illustrated by a map drawn by Mr. Arrowsmith. The map itself was drawn on Schomburgk's authority before returning to Guiana. But there is a red line across it to represent "the boundary as claimed by Great Britain," for which Mr. Arrowsmith is solely responsible. It is officially repudiated, and is of no authority. Schomburgk had nothing to do with it. The proof of this is that the same line appears on Arrowsmith's map, in his Atlas of 1832. It is erroneously called the first Schomburgk Line, and has often been copied.

The true Schomburgk Line is shown on the official map. The portion from the mouth of the Amakura to the junction of the Akarabisi with the Cuyuni was discovered and surveyed by Schomburgk himself in 1841. The portion about Mount Roraima, as far as Mount Irutibuh, was also surveyed by Schomburgk. The rest, following the Cuyuni river, is drawn in accordance with the proposal in his report. When Sir Robert Schomburgk completed his surveys he sent in six reports, and compiled two maps which have never been published. His own maps, on a very large scale, only carried the line to the junction of the Akarabisi with the Cuyuni. All this material was placed in the hands of Mr. Hebert, of the Quarter-Master General's Department at the Horse Guards, who compiled a beautiful map, showing the complete Schomburgk Line, in 1842. This map was lithographed in 1887. It was compiled exclusively from Schomburgk's materials. Copies of this official map, in two sheets, have now been presented to the Royal Geographical Society.

THE MONTHLY RECORD

EUROPE.

The Jubilee of the Russian Geographical Society.—On January 21 (February 2) last, the Russian Geographical Society celebrated its jubilee. Numerous telegrams and letters of congratulation were received from all parts of the civilized world, from other geographical societies and scientific bodies, as well as from different parts of Russia itself, where the society has several branches. The Emperor addressed to it a letter couched in very sympathetic terms, in which the study, by members of the society, of the customs and institutions of the motley populations of the Empire, as preparatory to a better understanding by the Government of the conditions for their peaceful development, received special acknowledgment. The Emperor announced a further yearly grant of 15,000 roubles (£1500), in addition to the 15,000 roubles already received by the society from the State's exchequer. A full history of the scientific activity of the society was prepared for the day by M. P. de Semenoff, who has been for so many years president of the Physical Geography Section and vice-president of the society, and long abstracts from it have been published in the *Historical Review* (*Istoricheskiy Vyestnik*), while M. de Semenoff's jubilee speech contains a brief summary of the same. The whole work, 1500 pages thick, containing many portraits, was issued same day. The idea of the foundation of a geographical society originated in St. Petersburg in the year 1844, in four different circles: the circle of the navigators, Lütke, Krusenstern, Wrangel, and Ricord; the Academical circle of the naturalists, Karl von Baer, Struve, Helmersen, and the statistician Köppen; the circle of the General Staff officers, Th. Berg (later field-marshal) and M. N. Muravieff; and the circle of men, mostly young, anxious to promote Russian science—the geographer, Arsenieff; the well-known traveller, Chihacheff; the great student of the Russian language, Dahl; Perovsky, who became known later on by his journeys to Central Asia; and Prince Odoevsky; round whom gathered the brothers Milutin, P. Valueff, S. Noroff, Vernadskiy, Count Uvaroff, Kavelin, Samarin, P. P. Semenoff, and others. This was quite a phalanx of future scientists and statesmen. Of these individuals, whose names are now familiar in science, the naval officers Lütke and Arsenieff were tutors of the young Prince Constantine, and it was through them that permission was obtained from Nicholas I. to found the society. The quadruple origin of the society is extremely interesting, because it led soon to the division of the new society into four sections (mathematical geography, physical geography, ethnography, and statistics), each of which had its own meetings, its own secretary, and its own life; in this way much more scientific work could be done than if all four divisions had been huddled together. This is one of the reasons why such a variety of scientific researches in the four domains into which geography was subdivided has been done by the Russian Geographical Society, and also why its expeditions have always taken the character of scientific explorations, as is strikingly shown in the explorations of Karl Baer, Hoffmann, and Helmersen in Russia; Ludwig Schwartz and his followers in Siberia; Semenoff, Severtsoff, and Prjevalsky and their followers in Central Asia. At the same time, as the learned ex-president points out in his jubilee speech, the desire of getting rid of serfdom, which inspired the generation of 1844, and consequently the desire to know better the life of the Russian people, also found its expression in the society, rallying round it some of the best forces of the country, which took a leading part in Russian economical science, history, and public life. The same tendency led many members of the society to devote their energies to, and to take the initiative in, the study of the customary law, the organization

of landed property, and the judicial customs prevailing both in Russia proper and among the mountaineers of Caucasia, the Mussulman population of Turkistan, and the natives of Siberia, thus preventing a reckless destruction of their institutions by the State. This is what the Imperial letter makes allusion to. In his brief review of the society's activity, M. de Semenoff divides its history into four distinct periods. During the first period (1845–1850), under the vice-presidency of Th. P. Lütke (the Grand Duke Constantine being the honorary president), the society sent out the well-known Ural expedition, under K. Hofmann, which may be said to have laid the foundations of Russian geology. During the second period, which is described as the "nationalist period" of the society, the foundation was laid, under the vice-presidency of M. N. Muravieff, of the study of the Russian people itself—its ethnography and institutions—and only the first steps were taken for sending out the great Siberian expedition. The two branches, Siberian and Caucasian, were founded at that time, and this idea of having quite independent but affiliated societies in the different parts of the Empire proved to be most productive of local research. The third period (1857–1871), during which Count Lütke was again vice-president, is distinguished by great geographical activity. The great Siberian expedition explored Siberia, the Amur, and the Usuri territory; numerous expeditions went to the Tian-Shan and the recently annexed Turkistan; to Manchuria, Mongolia, Kulja, Kashgaria, and even to Persian Khorassan. The basins of the Caspian and the Aral Seas were opened for scientific exploration; while within Russia itself the grain trade, the village community, and the ethnography of West Russia were busily studied. To the fourth period (1871–1896), M. de Semenoff gives the name of the period of the expeditions of Prjevalsky. An immense part of Central Asia was conquered for science during that period, while members of the society explored Mongolia, the unknown parts of China, Northern Siberia, the outskirts of Turkistan, and the Aral-Caspian depression, and began a series of detailed and exact works, such as the levelling of Siberia and the Aral depression, the meteorology of Central Asia, the polar station at the mouth of the Lena. At the same time a series of exact geodetical and hydrographical surveys, often discussed and prepared in the society, were accomplished by specialists, who are all members of the society, and communicate to it the results of their special work. At the present time the society becomes more and more a centre of union for all those who devote themselves to the scientific and detailed natural history exploration of the immense territory of Russia.

ASIA.

The Trans-Siberian Railway.—It appears, from the last official reports published in the *Official Messenger*, that the state of the Trans-Siberian railway on December 11, 1895, was as follows: The first section, Chelyabinsk to Omsk, 493 miles, was quite ready; the temporary stations were erected along the whole line, and the iron bridge across the Irtysh was building. The cost of a second-class return ticket from St. Petersburg to Omsk (2673 miles) is, according to the new zone tariff, less than eight pounds. On the second section, from Omsk to the Ob river, near Tomsk, 384 miles, rails were laid on the whole length, and all wooden bridges were ready; more than two-thirds of the necessary earthworks were finished, and the great iron bridge across the Ob (2520 feet long) was begun. On the third section, Ob to Krasnoyarsk, 476 miles, the rails were also laid on the whole length on December 17, 1895. All wooden and smaller stone bridges were finished, and over one-half of all earthworks were completed. It may thus be said that very soon St. Petersburg will be connected by rail with the Yenisei, on a length of 3057 miles. On the next section, Krasnoyarsk to Irkutsk, 672 miles, where the first difficulties

are met with, as the railway has to cross a hilly region of moderate height, nearly 38 per cent. of all earthworks were accomplished, and part of the smaller bridges were built. On the Trans-Baikalian section, 701 miles long, from Mysovaya, on Lake Baikal, to Sryetensk on the Shilka (the head of the Amur navigation), where the railway has to be pierced in the steep rocky foothills along the southern shore of the Baikal, and then, gradually rising on the plateau to the height of over 3500 feet, has to descend to Chita, the work was also begun, and part of the rails was shipped to Vladivostok. As to the Pacific end of the railway, the line from Vladivostok to Grafskaya on the Usuri, 250 miles, was completed, and nearly quite ready; while on the North Usuri section, Grafskaya to Khabarovsk, 225 miles, where very great difficulties are to be surmounted on account of the low and marshy character of the region, partly inundated during the heavy rains of the latter part of the summer—73 per cent. of the work of clearing the forests, and 52 per cent. of the earthworks had been completed. As is known, it also enters into the plan of the Siberian railway to connect the northern line, Perm to Tyumen, with the southern main trunk, by means of a branch railway between Ekaterinburg and Chelyabinsk, 150 miles long. This important line, which will bring the main trunk in connection with all the chief ironworks of the Central Urals, has progressed very satisfactorily, rails having already been laid over the whole of its length. Finally, a new great line, which will cost about 35,000,000 roubles, has been projected. It will connect Perm (on the Kama) with Vyatka, and this last with Kotlas, a river-port at the junction of the Vychegda and the northern Dvina, attaining a total length of 619 miles. This great north-eastern railway is intended to direct the cereals, which will soon be exported in large quantities from Western Siberia, towards the port of Arkhangel, and it will certainly give new life to Western Siberia, by opening for it a port on the White Sea. The preliminary exploration on this line is completed, and building begins this year.

Distribution of Armenians in Asiatic Turkey and Transcaucasia.—The first number of *Petermann's Mitteilungen*, 1896, has an article on this subject, illustrated by a map compiled by the editor, embracing the eastern parts of Asia Minor, Turkish Kurdistan, and Armenia, Northern Syria, and the south-west of Transcaucasia. The text is based, with reference to the Turkish area, on a communication by Lieut.-General Selenoy to the eighteenth volume of the *Zapiski* of the Transcaucasian section of the Imperial Russian Geographical Society, and with reference to the Russian area, on a statement drawn up by the Russian Councillor of State, N. v. Seidlitz, on the basis of the family registers of 1886. The main authority followed by Selenoy is Vital Cuinet's "La Turquie d'Asie," the figures in which have been collated with those of all other available authorities, and corrections made in accordance with explanations given in the text of the article referred to. Lieut.-General Selenoy's paper deals specially with the nine vilayets of Erzerum, Bitlis, Van, Diarbekir, Mamuret-el-Aziz, Sivas. Trebizond, Aleppo, and Adana, and the main general results are the following: (1) that in these nine vilayets collectively the Armenians do not make up a sixth of the entire population, the number of the Mohammedans is five times that of the Armenians, while Greeks, Nestorians, and other Christians make up about one-tenth of the population; (2) that in the five vilayets of Erzerum, Van, Bitlis, Mamuret-el-Aziz, and Diarbekir, which contain two-thirds of the Armenian population belonging to the nine vilayets named above, the Armenians form scarcely a fourth of the entire population, the Mohammedans being nearly three times as numerous, and Greeks, etc., constituting about 7 per cent. of the population; and (3) that Armenians form the larger part of the population in none of the nine vilayets, in only one (Van) out of the 25 sanjaks into which the first eight vilayets are divided (details are wanting

for the vilayet of Adana), and in only nine out of the 159 kazas into which these 25 sanjaks are subdivided, and that only according to the estimates most favourable to the Armenians. In Transcaucasia the Armenians exceed 50 per cent. of the population only in the government of Erivan. In that of Elisabethpol the proportion is 35 per cent.; in that of Tiflis, 24 per cent.; in the territory of Kars, 21 per cent. In no other government or territory does it amount to as much as 10 per cent.

AFRICA.

The Source of the Niger.—Colonel J. K. Trotter, of the Intelligence Branch, member of Council R.G.S., who is taking part in a joint delimitation between Sierra Leone and French territories, writes as follows from Tembi Kundu, under date January 10: "We got here, both Commissioners together, yesterday, and found the Niger source very distinctly marked. It is a small spring issuing from a hillside in a deep wooded ravine. On the rock where the stream issues is inscribed 'G. B. 1895.' These are the initials of the French captain, Brouet, and the bottle he placed in the stream is still there. The natives are afraid to look on the water, believing that if they do they will die within a year, and our guide who took us to the place couldn't be persuaded to enter the ravine. They were anxious that we should offer a sacrifice to the devil, the only deity they acknowledge. The position of Tembi Kundu is in lat. 9° 5′ 20″ N. (mean of observation). As regards longitude, we must wait till we get Grant's results next month. Tyler, who is with me, is going to take a photograph of lunar distances (Hill's method) when the moon is available, which is not for about fourteen days. We have travelled too fast to carry meridian distances, but had a two days' rating at Kon, which, after rating here, may give us some approximate results. Our longitude by traverse (perambulator), checked by latitude, and allowing for circuitous routes, makes this place about 10° 50′ W.—much further west than we expected. We have taken latitude at almost every halting-place. The height by aneroid of our camp is 2800 feet (mean of reading). This is a surprise to us, as we believed we were going up to 6000 feet, from what previous reports told us. The aneroid was compared at sea-level, and is, I think, trustworthy, as there is very little change in the barometer from climatic causes in this country. There are mountains in sight which must be over 4000 feet high. Within 250 yards of the Niger source is the source of a river flowing south-east into Liberia, and about half a mile to east is the source of the Bagwe river, flowing into Sierra Leone. The watershed is very clearly marked in this neighbourhood, and the country is fairly open, the valleys only being wooded, and the hills covered with dry cane brake, which the natives have burned in many parts. It is a great comfort, after travelling for a month in the bush, where one doesn't get a view above once a fortnight, to get one's head above water and see the whole country round. Tyler has taken and developed many photographs. The French captain, Passaga, has also taken a large number."

The New State of Belda, in the Central Sudan.—M. Antonin Goguyer draws attention in the *Revue Française et Exploration* (August, 1895) to the importance of the lately founded state of Belda, in the region between Lake Chad and the Benue, and its probable influence in moulding the future history of those regions. The writer traces the events which led to the foundation of this state by Hayato, a zealous propagandist of the Tijani sect of the Mussulmans of those regions. According to the account given, this man was a prince of the ruling family at Sokoto, who, partly through the reputation for piety of his father, partly through alliance by marriage with the Tijanian *Moccadem* of Ngaundere, has acquired an immense influence among the Fulbe, especially among the chiefs of Mandara, Marua, and other places near his residence at Belda. The adventurer,

Rabah, paid a tribute to his importance by forming an alliance with him before setting out for the conquest of Bornu. M. Goguyer thinks that this state is destined to overthrow the tottering empire of Sokoto, and draws conclusions as to the policy which France should pursue in view of the coming revolution. This subject cannot be touched upon here, though it may be remarked that M. Goguyer's statement that Belda falls within the French zone is difficult to understand. Dr. Passarge, in his book on 'Adamawa,' lately published, gives some particulars as to the rise to power of Hayato, but throws doubt on the statement that he was a prince of Sokoto. As the last-named writer remarks, Belda was in Barth's time a pagan village placed on a rocky height.

Dr. Stuhlmann on the Uluguru District, East Africa.—Dr. Stuhlmann contributes to the *Mitteilungen a. d. Deutschen Schutzgebieten* (1895, No. 3) a sketch of the Ulunguru mountains, from observations made during his visit in the latter part of 1894. The district lies a little away from the edge of the central plateau, abreast of Southern Usagara, from which it is separated by the plain of the Mkata. The central mass consists of gneiss, forming in the north a chain of rugged peaks, and in the south the extensive plateau of Lukwangulo. It is surrounded on the east, west, and south by outlying hills, separated from it by longitudinal valleys. Numerous streams have cut deeply into the mountain mass, forming transverse valleys in the central parts, but afterwards longitudinal ones in the direction of the strike of the rocks, and finally breaking through the outer edge by a transverse valley. All find their way into the Kingani, which derives practically all its water from this region. The central and higher parts are exceedingly moist, cloud and mist being prevalent, and rain falling nearly every day. At an altitude of 6000 feet the thermometer often remains for days together no higher than 68° Fahr., while in the valleys of the outlying hills a shade temperature of 93° to 95° occurs. The steppe vegetation of the outer fringe of the district, which betokens great dryness, gives place in the intermediate valleys to tropical forest, lianas, and ferns. On the slopes of the central mass, the primæval forest, which covers its upper parts and sends down arms into the valleys, has apparently been cleared by the agency of man, its lower limit being clearly defined. The upper forest consists of giant trees interspersed with tree ferns, tree lobelias, etc., and draped in the higher parts with lichens, which give it a weird appearance. On the Lukwangulo plateau the forest gives place at 7500 to 7800 feet to a grassy upland, sprinkled over with stunted trees. Dr. Stuhlmann makes some interesting remarks on the decrease of the forests, and the probable change of climate which prevents its renewal when once destroyed. He agrees with Prof. Engler (*Journal*, vol. v. p. 170) in supposing a former connection with the West African forest region. The district is inhabited by various tribes under petty chiefs, and is thickly peopled. Maize is the chief crop, being grown in clearings on the slopes and reaped four times a year. Few cattle are reared.

Ports of Senegal.—The *Bulletin* of the Paris Society of Commercial Geography (1895, p. 774) contains some notes by a correspondent at Dakar, on the condition and prospects of the various commercial outlets of the French possessions on the Senegal. Dakar, in spite of its recent growth, and the advantages offered by its spacious bay, has not yet become the important port it might be, although the decision to make it a military port was arrived at long ago. It suffers much from want of quay-room. Its trade is subject to the rivalry of Rufisque, on the other side of the bay, the head-quarters of the export of ground-nuts (though the shore there is little protected); of Saint-Louis, which must always be the outlet for the trade of the Senegal river, in spite of the obstacle caused by the shifting bar of the river—this trade, however, is not likely ever to assume very great proportions;

and of Gorée, which by its free port attracted a considerable amount of commerce, the German and English lines of steamers making it a point of call, but which is now rapidly declining in importance. Dakar has, the writer says, allowed itself to be distanced by the port of La Luz, in Gran Canaria, of the growing importance of which he spoke in a previous letter. He expresses a doubt whether the commerce of Senegal is ever likely to be large enough to supply a multiplicity of outlets, and appears to favour a policy which would make of Dakar the administrative, no less than the commercial, capital of the country.

AMERICA.

Explorations in Canada.—The 'Report of the Commissioner of Crown Lands for the Province of Quebec,' for the twelve months ending June 30, 1895, contains the account of an important journey made by Henry O'Sullivan, D.L.S., inspector of surveys for the province, in the autumn of 1894, in the lands belonging to the Hudson Bay slope north of the upper Ottawa, and in the adjacent parts of the Ottawa basin. Till 1893 an area of about 50,000 square miles (as large as England) in this region remained unexplored, and was generally considered to be a cold rocky waste, in which there was little use in searching for anything worth having, except perhaps fish, game, and minerals. Mr. O'Sullivan's journey puts a totally different complexion on, at least, a considerable portion of this region. From what he has seen, he has very little doubt that there exists, "beyond the sources of the Ottawa, a fertile region several thousand square miles in extent, where there is an abundance of merchantable timber, principally tamarac, of which there is a sufficient quantity to supply sleepers for all the railways in the Dominion." The area embraced by Mr. O'Sullivan's route, which is illustrated by a map on the scale of about 1:380,000, is about 7000 square miles between Grand Lake Victoria and the upper Ottawa river in the south, and the north end of lake Waswanipi in the north. He started from the northern end of Grand Lake Victoria, the point fixed by him in a previous survey, in 1893, as in 47° 48′ 25″ N., 77° 20′ 05″ W., at an altitude of 960 feet, and proceeded thence northwards. About 3 miles from this point, instead of about 30 miles as was expected, the height of land was reached at an altitude of about 1000 feet. A portage only 6 chains in length here separates the waters of the Ottawa basin from those of the Mekiskan basin on the Hudson Bay slope. Immediately after crossing the water-parting, a remarkable difference was perceived both in soil and timber. In the upper Ottawa valley the prevailing rocks visible on the surface are gneiss and granite, and the soil is generally sandy and frequently strewn with boulders. The prevailing timber is Banksian pine or cyprès, which dots the surface here and there. North of the water-parting, on the other hand, the geological formation is nearly all sedimentary rock, the soil is rich clay without boulders, the surface is level or gently undulating land, and the trees are poplar, "bouleau," and tamarac: no more cyprès; and though poor, rough, broken country, with cyprès and black spruce, was passed through in some of the higher tracts traversed on this journey, fertile clay lands continued to be the rule at lower elevations. From the height of land, Mr. O'Sullivan's route was first northwards through a series of lakes connected by stretches of river with rapids, the last of the lakes, Lake Shabokoma, receiving from the east, near its south end, in 48° 26′ 35″ N., 77° 10′ 20″ W., the river Mekiskan, which from this point flows northwards, and ultimately north-westwards. The lake just mentioned, previously unknown, lies at the height of 850 feet, and has a length probably exceeding 40 miles, with a varying width. Its southern portion, 22 miles long, is mainly part of the course of the Mekiskan, and, from native reports, Mr. O'Sullivan concludes that it extends about 20 miles north-east from

the point where the Mekiskan issues from it. After joining this river, Mr. O'Sullivan followed it as long as it maintained its northern course; but at the point where it begins to flow north-west, about 49° 12′ N., he diverged eastwards up a small stream which he called the Wedding river, on account of his having discovered it on the anniversary of his wedding-day. From this river he crossed the water-parting to the Otter creek, which led him to Lake Waswanipi, a magnificent sheet of water at the height of 680 feet, "surrounded by a splendid-looking country, level or gently rising in easy slopes, of the richest soil all around, timbered with large spruce, fir, tamarac, bouleau, poplar, etc." The Hudson Bay Company's station at the north end of this lake was the terminus of the outgoing journey. The return was made southwards by the Little Waswanipi, part of the upper Mekiskan, and the Kekek Sibi, to the height of land separating the Mekiskan and Ottawa basins in 48° 8′ 45″ N., 75° 53′ 45″ W., and thence south-westwards by the Kapitajewan, and finally south to a point on Wagner's Line on the Ottawa in 47° 56′ 30″ N., 76° 54′ 30″ W., which formed a closing-point in his journey of 1893. Mr. O'Sullivan thinks there is every reason to believe that the climate of the fertile and well-timbered region explored by him can compare favourably with that of the country along the St. Lawrence between Quebec and Montreal; and, with regard to access, states that "there is certainly no obstacle to the building of a railway from any part of the province into the heart of this country, and canals can also be easily made between the St. Lawrence and Hudson Bay waters."

The Great Bank of Newfoundland.—Captain W. T. Main, of the Allen Line steamer *Corean*, sends us an account of his observations on the Great Bank of Newfoundland, extending over the many years during which he has been in command of steamers on the Canadian service. The Great Bank extends from lat. 43° to 49° N., and from long. 47° 30′ to 57° 30′ W., with depths varying from 3 to 100 fathoms, and a bottom composed principally of sand and shells. The configuration of this bank is of the utmost importance in navigation, as the soundings on it are the first obtained by a vessel crossing the Atlantic bound for Canadian ports, and the lead has to be relied upon more than in most cases on account of the prevalence of fogs. As Professor Thoulet has pointed out, the melting of the drifting icebergs from the Arctic regions has probably led to the formation of the bank, and Captain Main shows how the charts of the survey of 1859 are rendered quite untrustworthy by the accumulation of ice-borne *débris* in some places, and the ploughing action of large icebergs which materially increases the depth in others. The soundings on the northern part of the bank are also not numerous enough for practical purposes. Captain Main supplemented these soundings, and on his report of a bank the depths on which were characteristic enough to be of service in approaching the port of St. John's, one of H.M. ships on the North American station surveyed it in 1893, and confirmed his opinion of the value of these soundings in navigation. The bank is 8 miles long from north to south, and 5 miles broad from east to west, with depths of from 59 to 77 fathoms; the middle of the western edge of the bank lies 21 miles due east of Fort Amherst, at the entrance to St. John's harbour. The soundings to eastward and also westward of the bank close up to the shore range from 80 to 90 fathoms. By steering a course so as to cross this bank from the westward, a comparatively ice-free track is obtained, as most of the bergs carried by the Arctic current sweep round the north-east of the Great Bank, or strand upon its northern edge.

The Nicaragua Canal.*—The waterway is to start from Greytown, where it is proposed to create a harbour, if this is not impossible as some suppose. Proceeding

* 'The Key to the Pacific.' By Archibald R. Colquhoun. London: A. Constable & Co., 1895.

towards Lake Nicaragua and the Divide, ships are to be lifted through three locks, with a rise of 45, 30, and 31 feet respectively. They will then pass through the Divide, an excavation under 3 miles long, and for which 12,000,000 cubic yards must be removed, of which 7,000,000 consist of solid lavas, etc. They will next navigate a series of vast basins and the San Juan river to Lake Nicaragua. In order to produce these navigable waters, a series of gigantic dams is to be made. That at Ochoa over the San Juan valley is to be 1250 feet long and 70 feet high, and there are many others from 70 to 20 feet in height. These dams are to be made by stretching cable trams across the valley, and patiently tumbling down rocks until these find a permanent home in its bed and gradually form the embankment. Lake Nicaragua, with some 1200 feet of dredging, affords a waterway of 56½ miles, after which the ships are to be conducted down the Rio Grande valley to Brito. This valley will be turned into another reservoir by a huge embankment 1800 feet long and 70 feet high, and three more locks are provided to lower the ships 110 feet, whence they will proceed to the proposed harbour at Brito, and emerge on the Pacific. This truly gigantic undertaking, the cost of which is estimated at £30,000,000, will, according to Mr. Archibald Colquhoun, "certainly be made." Three points are, however, considered by some authorities to be impossible, viz. the Ochoa dam, the Divide excavation, and the Greytown harbour. His book contains full details of the scheme, and an account of Nicaragua, which we may briefly describe as a sort of large West Indian island, with an annual rainfall of 290 inches, and corresponding climate. By no means the least valuable portion of 'The Key of the Pacific' is Mr. Colquhoun's description of the probable effect of the canal on the world's commerce. Melbourne and Yokohama will then be 9287 and 8650 miles from New York, whilst at present they are 11,350 and 11,765 miles from Liverpool. This scheme will therefore "bring about the most serious rivalry to the commercial supremacy of Great Britain which she has yet to encounter." Moreover, it is to be an "American canal in American waters," though, in some not clearly defined manner, "neutral." There is a historical summary, from which it seems clear that, if the English traders of 1698 had refrained from destroying Paterson's Scottish colony at Darien, we should now hold this "Key of the Pacific." The book is abundantly provided with illustrations, some of which are not particularly clear, and the engineering and other details are very fully described.

POLAR REGIONS.

Dr. Nansen's North Polar Expedition.—There has been widespread interest and excitement over a telegram received in the early part of February, as follows: "Irkutsk, January 31 (February 12).—The contractor for Nansen, Kushnareff, through the Kolymsk *ispravnik* (chief of police) Kandakoff, by mail from Yakutsk to Kirensk, and thence by telegraph, informs the *Eastern Review* that Nansen has reached the Pole, has discovered land, and returns."—(*Official Messenger*, February 2 (14); telegram of the Russian Telegraphic Agency.) At first the tendency was to place some credit in this telegram. But, as time passed and no word was received direct from Nansen, and as the conditions under which the telegram seems to have been sent were examined, much greater scepticism was displayed as to the truth of the news conveyed. In a letter to the President from M. Grigoriev, Secretary of the Russian Geographical Society, he expresses grave doubt as to the truth of the statement. In this he was confirmed by a conversation he had with the Governor-General of Eastern Siberia, who could not believe it possible that any official could have received such information without communicating it to him. This disbelief is shared by General Osten Sacken, as also by Baron Oscar Dickson. The latter wrote to the *Times*, expressing his belief that if the *Fram*

had been seen it must have been because she never had got to the Pole, but had been drifting about for two winters, and had approached the New Siberian islands. It is not stated that either Nansen or any of his men have been seen. On the whole the weight of evidence seems to be against the accuracy of the news. Every one would rejoice if Dr. Nansen's object had been accomplished; if it has, we ought to receive authentic information within a very short time. Meantime we can only wait.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Deep Soundings in the Pacific.—Commander A. F. Balfour, in the course of soundings in the southern Pacific, carried on in H.M.S. *Penguin*, has come across deeper water than has before been found in any part of the oceans. Leaving Tongatabu, he went to the spot where he had in July last failed to reach bottom with 4900 fathoms of wire. Here he found 4940 fathoms, but failing to recover a specimen of the bottom, he tried again, after putting new wire on the machine, and got bottom at 5022 fathoms, a short distance from the first cast. This was in lat. 23° 39′ S.; long. 175° 04′ W. Captain Balfour steered east further into the Pacific for 50 miles, but found bottom at 3100 fathoms. Steering south, parallel to the line formed by the Tonga and Kermadec Islands and the banks between them, after getting various depths between 2200 fathoms and 4400 fathoms, he, at about 100 miles E.N.E. of Sunday Island of the Kermadec group, struck another deep hollow of 5147 fathoms, and successfully recovered a specimen of the bottom. The next sounding was 3380 fathoms, but when 100 miles east of Macarthy Island, 5155 fathoms was obtained, and a specimen again brought up. The soundings now became gradually less deep. The deepest sounding heretofore obtained was 4655 fathoms, by the U.S.S. *Tuscarora*, near Japan in 1874. The *Penguin's* deepest cast is therefore exactly 500 fathoms, or half a sea-mile deeper. Doubtless there are deeper places yet to be found. The positions of these hollows form no exceptions to the already observed fact that the deepest spots in the oceans are not far from land or shallow water, and seem therefore to be complements of the movements which have forced the submarine ranges upwards.

Morphology of Coasts.—Herr Paul Guttner discusses the geographical homologies of coasts in the *Mitteilungen* of the Leipzig Geographical Society. He defines the word "coast," not as the boundary *line*, but the boundary *zone* between land and sea, and views it as the scene of constant warfare amongst the terrestrial, marine, atmospheric, and biological agents of change. Geographical homologies are defined as "similar forms of the Earth's surface produced by the similar action of similar agencies." The various kinds of coast are minutely classified under the great divisions of coasts wrought by the action of water on hard rocks, soft rocks, and on detrital material, and by the action of living creatures. The second half of the essay deals with the special conditions of low coasts, such as are produced by the action of rivers distributing detritus. The sinuosities of these coasts are compared with circular arcs, and, as an index of curvature, the author takes the cosine of half the angle subtended by the arc inscribed in the bay. A table of 436 incurves or outcurves of low coasts is given, showing the name or some particulars by which the place can be found on a map; the latitude and longitude to seconds of the beginning and end of the curve; the actual measured radius in millimetres of the corresponding circle: the angle subtended by the arc; the radius in kilometres; the index of curvature; and an indication as to whether the curve is convex or concave to the sea. The mud coasts under consideration are found mainly in regions of great rainfall, and their curves vary in every gradation from straight lines to closed circles—in lagoons or islets—chains of which, parallel

to the shore, are characteristic of this type of coast. The possible origin of straight coasts and of curves of different radius by wave-action is considered briefly, and the elaborate essay concludes with some remarks on special features of coasts bordering the open sea. The memoir represents a great mass of work, but the discussion does not appear to reveal results of such importance as the author might reasonably have anticipated for his labours. A special case of the same problem is dealt with by Mr. Cleveland Abbe, junr., in his "Remarks on the Cuspate Capes of the Carolina Coast," in vol. xxvi. of the *Proceedings* of the Boston Society of Natural History. This appears to be also a purely theoretical discussion, based on maps and reports, not on actual observations; and it concludes with the hypothetical explanation that the long shallow bays between the cuspate capes are formed by the joint action of waves and of back-running eddies of the Gulf Stream working on the flat shores of detrital material.

American Geographical Monographs.—In March, 1895, the National Geographic Society of Washington commenced to issue a series of 'National Geographic Monographs,' to be published by the American Book Company monthly during the school year, for the special benefit of teachers and students. They are intended to supplement text-books by supplying the most recent information as to geographical theory and discovery. The three first numbers are of general interest, the others more particular, dealing in detail with particular features of the United States. Major Powell is the author of the three monographs on 'Physiographic Processes,' 'Physiographic Features,' and 'Physiographic Regions of the United States.' His definition of physiography—"a description of the surface features of the earth, as bodies of air, water, and land," is that more usually applied in this country to physical geography. The processes of physical geography are explained concisely as motions in the three envelopes of air, water, and rock, which enclose and conceal the unknown inner mass of the globe. Vertical changes in the land are due to *vulcanism* and *diastrophism* (a term including upheaval and subsidence), while horizontal movements involving the transport of material are termed *gradation*. When speaking of physiographic features, Major Powell considers plains and plateaus, mountains, hills, stream channels and cataracts, fountains, caverns, lakes, marshes, coast-forms, and islands. These are all classified according to origin into the three classes—vulcanic, diastrophic, and gradational. Subaqueous forms are not considered. The 'Physiographic Regions of the United States' comprise four slopes—to the Atlantic, the Gulf of Mexico, the Pacific, and the Great Lakes. A map is given, showing a minuter subdivision into plains, plateaus, and mountains, the various groups being distinguished by special names. The original name of *Stony mountains* is restored to the mountains which extend through Washington and Wyoming, the later name of *Rocky mountains*, having been so loosely applied as to lose all value as a definite term, is used as a general indication of the whole range of regions. It seems a pity that, for the purpose of a new classification which aims at being scientific and exhaustive, the continent of North America was not taken as a unit instead only of its central zone arbitrarily truncated by political boundaries. Practically, this difficulty would be felt most by teachers in the regions bordering on the frontiers, but theoretically the matter is of some importance, as the subdivision by natural regions of an artificial unit, however large that unit may be, can never be logically complete.

GENERAL.

Hints to Travellers—Museum of Paris.—A series of public lectures and conferences by the professors and assistants of the Paris Museum was carried on during 1895, with the object of affording travellers thorough instruction in

scientific collecting. These lectures have been collected and arranged by M. H. Filhol, and published by the Minister of Education. The work extends to 303 pages, and deals with anthropology, botany, geology, and all branches of natural history and comparative anatomy. The treatment of the eighteen chapters varies greatly, and it is difficult to tell how much of each chapter is due to any particular professor or to M. Filhol himself. In most cases certain data are given as to the habitats of the creatures concerned, sometimes extending to great length, and of a very popular nature. For others, *e.g.* Némathelminthes, we find that these "are worms living in a free condition or as parasites. When free they are found in fresh water, in salt water, or in moist earth." The botanical notes appear to be almost entirely taken from Verlot's work, 'Guide du Botaniste herborisant.' But a new method is given of breaking off flowering branches growing at the top of inaccessible trees, viz. by firing at the branch to which they are attached. Many of the zoological notes are also due to 'Le Naturaliste,' by M. L. Vaillant. The use of acetate of soda is recommended for preserving fish and other specimens; and dredging apparatus, labels, etc., are taken up in great detail. The work is neither an introduction to the study of all these various sciences, nor a concise, short, and practical guide to collecting, but a combination of both. It is somewhat strange that Livingstone's name should be spelt wrongly.

OBITUARY.

General James T. Walker, R.E., C.B., F.R.S.

By THE PRESIDENT.

THE death of General James T. Walker, R.E., C.B., F.R.S., LL.D., which took place on the 16th of February, is a very serious, and in some respects an irreparable, loss to our Society.

There are few men who have, during a service of upwards of fifty years, worked with such zeal and industry, and with such signal ability for the public interests and for the good of his country. Born in 1826, James Walker was the son of Mr. John Walker, of the Madras Civil Service. Passing at Addiscombe in December, 1844, he was appointed to the Bombay Engineers, and arrived in India on May 10, 1846. His active service commenced with the second Punjab campaign. He was field engineer at the second siege of Multan. When the town was stormed, he was in charge of a party of fifty sappers and miners. While charging the Mohon Gate a powder magazine exploded, killing eleven and wounding thirty-three of his party. Dashing through the blazing woodwork and falling walls, Lieut. Walker, at great personal risk, succeeded in extricating three of the party from the *débris*. He also served at the battle of Gujerat, and in the subsequent pursuit. From 1849 to 1853 he was engaged on the military reconnaissance of the Trans-Indus region from Peshawur to Dera Ismail Khan, arduous work well performed, and all the more meritorious because it was executed single-handed, in a very disturbed region. During this period he served with distinction in many of the encounters with hill tribes on the frontier; and he completed a military survey over 8761 square miles.

On December 1, 1853, Lieut. Walker became an assistant in the Great Trigonometrical Survey of India, under Sir Andrew Waugh, his first employment being the measurement of the Chach base near Attock. The Indus series connected the Chach and Karachi bases, and Walker had charge of the northern section. He was occupied with this work when the mutinies broke out in 1857.

Walker was then attached to Sir Neville Chamberlain's moveable column. At the siege of Delhi he had been told off to blow up the Kashmir gate, but he was severely wounded, and afterwards was attacked by cholera. He was promoted to the rank of captain in December, 1857, and of major in 1858.

Returning to his surveying duties at the close of the war, he resumed work on the Indus series, which was completed in 1860, and he was afterwards employed on the Jogi Tila meridional series. On the completion of this work, the Surveyor-General wrote to him in the following terms:—"The brilliant success which invariably attends your undertakings is a proof of the high professional qualifications, the foresight and judgment which you bring to bear on the important geodetical work on which you are engaged." During 1860 he served in the Mahsud Waziri Expedition. Captain Walker had become a Fellow of this Society in 1859, and in 1862 he contributed his admirable paper on the highland region adjacent to the Trans-Indus frontier (*R.G.S.J.*, vol. xxxii. p. 303).

On March 12, 1861, Major Walker succeeded Sir Andrew Waugh as Superintendent of the Great Trigonometrical Survey of India, and in the next two years the three last meridional series in the north of India were completed. Walker's first independent work was the measurement of the Vizagapatam base line, which was completed in 1862. To show the accuracy of the calculations, it may be mentioned that the difference between the measured length of the base line and the length as computed from triangles, commencing 480 miles away at the Calcutta base line, and passing through dense jungle, was half an inch. A revision was next undertaken of the triangulation of Lambton in the south of India, work executed during the early part of this century, with re-measurements of the base lines. In February, 1864, Walker attained the rank of lieut.-colonel.

On his way home on leave in 1864, Colonel Walker visited Russia, and established very friendly relations with the geodesists of the Russian survey. Through this wise step he was well supplied with geographical information from Petersburg, and there was a cordial feeling of co-operation between the officers of the two services. For instance, when Colonel Walker undertook a series of pendulum observations, the convertible pendulums were lent him by the Imperial Academy of Sciences at Petersburg. Colonel Walker was again on leave in 1871–72, when he, in conjunction with Sir Oliver St. John, fixed the difference of longitude between Tehran and London. He also made a thorough investigation of the condition of the plates of the Indian Atlas remaining in England, and wrote an important memorandum on the projection and scale of the atlas. On his return he gave much attention to the question of the dispersion of unavoidable minute errors in observations for latitudes, longitudes, and azimuths, to obtain the closest approach to accuracy. At about the same time a gigantic work was undertaken, the 'Account of the Operations of the Great Trigonometrical Survey of India,' to consist of twenty volumes. The first nine were published by General Walker, and the first appeared in 1871. It contains his introductory history of the early operations of the survey, and his account of the standards of measure and base lines. The second volume, also mainly by Colonel Walker, consists of an historical account of the triangulation, with descriptions of the method of procedure, and of the instruments employed. The fifth volume is an account of the pendulum observations by Colonel Walker. The superintendent's work as a geographer was only second in importance to his geodetic labours. His office at Dehra Dun was a hive of ceaseless and intelligent industry. Explorers were trained, survey parties were organized for every military expedition, native surveyors were despatched to make discoveries, and their work was reduced and utilized. Numerous valuable maps were published, and Walker's map of Turkistan went through many editions, and was the leading authority for

upwards of twenty years. On January 1, 1878, Walker, who had become a full colonel in 1869, undertook the exceedingly laborious post of Surveyor-General of India, in addition to the work of superintendent of the Great Trigonometrical Survey; and he continued to transact the whole business of the combined surveys until he retired.

After a most arduous service of twenty-two years as Superintendent, Walker retired, having become a major-general in December, 1878, and a lieut.-general in 1881. The date of his retirement was February 12, 1883, and in January, 1884, he was promoted to the rank of general. He was F.R.S. and LL.D. of Cambridge.

Colonel Tanner, one of the most distinguished of his colleagues, thus writes of Walker's services—"He was one of those who took up no subject without mastering it thoroughly. As the head of an important department, he made himself well acquainted with the intricate details of every branch of surveying, whether surveying in its ordinary sense or the more abstruse details of geodesy. I think I may say that he was looked up to by all under him as one who could advise every one on special questions. He could conduct, to the very best advantage, the most intricate and exact measurements, and at the same time could take a broad-minded view of the rougher systems of exploration and reconnaissance, which, under his *régime*, were pushed far over the Indian frontiers into Central Asia. General Walker's own speciality was rigorous trigonometrical surveying, but this did not lead him to favour that branch of the work more than the other. While he was Surveyor-General of India it must be acknowledged that every class of work was greatly improved, and brought to a higher state of perfection. No Surveyor-General has so left his mark on every branch of the survey of India. Under General Walker's administration, foreigners and Englishmen alike came to recognize the high excellence of the maps and records turned out by his officers."

Colonel Woodthorpe, C.B., writes that General Walker "was a just and appreciative chief, and a true friend, whose keen interest in all I have done under his successors was always a great encouragement to me. He was one of those whose friendship and approval any man might be proud to win. His kindness and patience with others having less knowledge than he possessed were very marked, and no one in difficulty turned to him for advice in vain. I have the liveliest recollection of many valuable hints given in friendly conversation with no assumption of superior knowledge."

No less affectionate are the reminiscences of Colonel Godwin Austen. Speaking of co-operation with General Walker in the compilation of the first map of Central Asia, he writes: "I shall never forget the great pleasure of meeting him daily, and how much I learnt from him. It was when engaged on such researches that Walker's knowledge and his intense love for geographical study showed itself."

General Walker saw the principal triangulation of British India completed during his incumbency, including ten base lines and 3668 stations, those on the plains being towers 30 to 40 feet high. As the Duke of Argyll well observed in his despatch of 1871, this great survey, as a record of accurate geodetical measurement and of arduous services well performed, will yield to none that has hitherto been published by any European nation either in interest or in scientific importance, while the final harmonizing of results necessitated the most elaborate calculations that have ever been undertaken for the reduction of triangulation. It was no small honour to have been the leader, during nearly a quarter of a century, of that devoted band of able public servants which composed the staff of the survey —*primus inter pares*. These men combine the knowledge and habits of thought of a Cambridge wrangler with the energy, resource, and presence of mind of an explorer or a backwoodsman; adding also all the gallantry and devotion which

inspire the leader of a forlorn hope. The danger of service in the jungles and swamps of India, with attendant anxiety and incessant work, is greater than that encountered on a battle-field; the percentage of deaths is larger, while the sort of courage that is needed is of a higher order, yet the well-earned rewards are withheld. When General Walker retired, his great services received no recognition whatever. Nevertheless, the story of the Great Survey forms one of the proudest pages in the history of English domination in the East.

After his retirement, General Walker gave himself little rest. In 1885 he became a member of our Council, and for ten years he has been one of its most active and most valued labourers in the field of geography. In the same year he was President of the Geographical Section of the British Association at Aberdeen. He kept up a large correspondence with geodesists throughout the world, always ready to give advice and to supply information. Only last Christmas he received a letter from the Astronomer at the Cape of Good Hope, thanking him for a copy of his paper on "India's Contributions to Geodesy." "There are few men," wrote Mr. Gill, "who can esteem it more highly than I do. If you will allow me to say so, I have never seen a summary of such a vast mass of work presented in so clear, neat, and complete a manner. Nothing that it is essentially necessary to know is omitted, and yet it seems almost impossible to have rendered an account of such a vast mass of detail in so small a space." In furthering the work of our Society, he was zealous and active. He superintended the construction of maps, drew up numerous reports and memoranda, gave much appreciated advice, and afforded invaluable counsel to young explorers. In 1885 he read a paper on the work of one of the most eminent of the native Trans-Himalayan explorers in Tibet, which elicited a full and valuable discussion (*R.G.S.J.*, ii., vol. vii. p. 65). In 1886 he discussed the question of the name given to Mount Everest, proving that the name "Gaurisanhar," applied to it by the Schlagentweits, was erroneous, and establishing his point by closely reasoned and conclusive argument (*R.G.S.J.*, ii., vol. viii. pp. 88 and 257). His papers on the Lun river of Tibet as the source of the Irawadi or Salwin (*R.G.S.J.*, ii., vol. ix. p. 352), and on the hydrography of South-East Tibet (*R.G.S.J.*, ii., vol. x. p. 577), are admirable specimens of the best kind of speculative geography. General Walker's latest service was his taking charge of the geodetic work of the International Geographical Congress last summer.

The work done by this illustrious geographer and geodesist, during half a century of service, is as prodigious in amount as it is valuable in quality. He will be missed by many friends, but by none more than by his colleagues of this Society. Ever ready with advice and help, punctual and conscientious in all he undertook, never sparing himself when there was work to be done, by our Council his loss will long be felt, and at present it is irreparable. James Walker was the most modest of men. His name ought to be in the list of our Gold Medallists; but he thought that the consciousness of having done his duty was a sufficient reward. On more than one occasion he refused to allow his name to be put in nomination for one of the royal awards. The matter was strongly urged upon him in 1894. His answer was, "I only did my duty." This most inadequate memoir shows what that unrewarded duty was, and how it was done.

General Walker was married in India, on April 27, 1854, to Alicia, daughter of General Sir John Scott, K.C.B., by Alicia, granddaughter of Dr. W. Markham, Archbishop of York. His widow survives him, and he leaves one son, Herbert, a promising young officer in the Royal Engineers, and three daughters to mourn his loss.

The Right Hon. Hugh C. E. Childers, F.R.S.

The Royal Geographical Society, as a body, shares in the general regret experienced at the death of Mr. Childers, which took place on January 29, he having been for many years (since 1858) a member of the Society. At the time of his death he was a member of the Council. Mr. Childers was born in 1827, being the son of the Rev. Eardley Childers, of Cantley, in Yorkshire. Having received his education at Cheam School and Trinity College, Cambridge, he sailed in 1850 for Australia, where he remained until 1857, taking part in the political life of the colony of Victoria. It was as agent-general for this colony that he returned to England in the latter year, soon after which (1860) he was first returned as M.P. for Pontefract, which borough he represented uninterruptedly for twenty-five years. The general election of 1885 having left him without a seat, he was a few months later returned for South Edinburgh, retaining the seat until his retirement from public life, due to failing eyesight, in 1892. Into the details of his political career, in the course of which he was in turn at the head of the Admiralty, War Office, Exchequer, and Home Office, we cannot enter here. Suffice it to say that his business-like capacities and honesty of purpose were generally acknowledged, and that he was sincerely attached to the Church. Besides being at various times a director of several public companies, he had been chairman both of the Great Indian Peninsular Railway Company and of the Royal Mail Steam-packet Company. He was twice married, his second wife having died only last year.

Captain W. W. May, R.N.

By Clements R. Markham, C.B., F.R.S.

Captain Walter Waller May, R.N., whose death is announced as having taken place on February 14, although he was not a Fellow of the Society, was an Arctic explorer of some standing. He served as a mate in the *Resolute* under Captain Austin, in the expedition of 1850-51, taking an active part in the sledging operations. From 1850 to 1854 he was first lieutenant of the *Assistance* in Sir E. Belcher's expedition, and went over 600 miles in seventy-eight days in a sledging journey. For these services he was promoted to the rank of commander, and soon afterwards he retired from active service. He became a retired captain in October, 1869. Captain May was an eminent water-colour painter. He published a series of sketches made during the voyage of the *Assistance;* and drew the illustrations for M'Clintock's voyage of the *Fox*. The bas-reliefs on the pedestal of Franklin's statue, in Waterloo Place, are also from his designs. For many years he exhibited his water-colour paintings, which fetched high prices. Captain May was appointed keeper of the Painted Hall at Greenwich last year. He was always ready to render services to our Society, and was especially useful in bringing together and arranging the collection of pictures for the Franklin commemoration. He formed one out of the fifteen old Arctic officers who were the guests of the Geographical Club on May 20, 1895. Several surviving old messmates will deplore his loss, and among them the present writer, who served with Captain May in the Arctic Regions, and was with him during a short exploring journey round Griffith island in June, 1851.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1895-1896.

Fifth Ordinary Meeting, January 27, 1896.—CLEMENTS R. MARKHAM, ESQ., C.B., President, in the Chair.

THE PRESIDENT said: Before proceeding to the paper of the evening, there are one or two remarks I think it desirable to make. In the first place, we must congratulate Mr. Borchgrevink on having succeeded in his wish to proceed this year to the Antarctic Regions. I understand that there will be a vessel going out for whaling purposes, and that he, with a small scientific staff, will take a passage in her, and be landed in Antarctica, probably near Cape Adare, where he will winter with his companions, and attempt to proceed into the interior on ski, or Norwegian snow-shoes, and he will be taken off again in the succeeding spring. I believe he intended to have worked with Mr. Astrup, but I regret, and we all regret, that that gallant Arctic explorer, who received one of our awards last year, met with a fatal accident in crossing one of the fjelds in Norway this winter.

I understand also that the Germans and Belgians are making great efforts to raise funds for an Antarctic expedition. Our Government has been unable to meet the wishes of scientific men in this respect, but I think we ought really to make one great effort to obtain funds for an adequate private expedition. I cannot help feeling that one good answer to the foolish abuse and invective of the foreign press, would have been for our Government calmly to fit out and despatch a well-equipped Antarctic expedition, which would be then doing a work common enough in this country, but not so common in the countries which have been abusing us. We should be doing work not only for ourselves, but for the benefit of the whole civilized world. You will also be glad to hear that M. Andrée is making good progress in his preparations for crossing the North Pole in a balloon, and we have had the pleasure of extending assistance in various ways to his Excellency, the Swedish minister, in order that he may give timely warning of the possible appearance of this balloon, to all the circumpolar stations of Alaska, the Hudson's Bay Company, and of Siberia. The commanders of these stations will be asked to warn the natives that the balloon is not a devilish or dangerous thing, but that it contains scientific people; and the natives will be requested to assist them in every possible way. I am glad to know that we have present with us this evening one of the dwellers in a circumpolar station, the Russian Consul at Vardoe, who sent out two expeditions for the relief of Captain Wiggins, and gave great assistance to Mr. Jackson and Mr. Trevor Battye.

ELECTIONS.—*Walter Henry Breeze; Captain Robert George Broadwood* (12*th Royal Lancers*); *F. A. Cooper; Brig.-General J. Jopp, C.B.; Harry Francis Keep; W. G. Lovell; Surg.-Major Macpherson; Captain G. O. Mennie, I.S.C.; Alfred James Schwabe.*

The Paper read was:—

"The First Crossing of the Southern Alps of New Zealand." By E. A. Fitz Gerald, Esq.

Sixth Ordinary Meeting, February 10, 1896.—CLEMENTS R. MARKHAM, ESQ., C.B., President, in the Chair.

Before proceeding with the business of the evening, it is my duty to mention the loss of two members of the Council. The Right Hon. Hugh Childers, I am afraid, had been failing for a long time. He joined the Council only two years ago,

though he had been a Fellow since 1858. He took a very great interest in our work, and was particularly valuable to us in advising on all matters of finance, and we very deeply regret his loss. The other loss is due to a very different cause. I allude to Lord Lamington, who has left England to take up the Governorship of Queensland; and when we bade him farewell, we felt sure that, although he left us for some time, he would still continue to be a very warm friend of this Society and of geography.

ELECTIONS.—*H. J. Allcroft; Joseph Edward Balmer; Lieut.-Colonel John A. Bindley, J.P.; William Bisiker; George J. Bridges; James Buckle; Rev. Frederick Charles Guise Cass; Herbert William Cribb; Rev. Louis Bredin Delap, B.A.; Harry Simpson Gee, J.P.; George M. Graves; James Hodson; Thomas Harris Lloyd; Professor J. W. Lowber, LL.D.; Philip Michaelis; Alfred Wilmot New; Captain Wellesley Lynedoch Henry Paget. R.H.A.; John Rew; Christopher Turnor.*

The Paper read was:—

"Movements of the Earth's Crust." By Professor John Milne.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., *Librarian*, R.G.S.

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce, Commercial.
C. R. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
J. = Journal.
M. = Mitteilungen.
Mag. = Magazine.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue, Revista
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

EUROPE.

Alps—Structure. *Ann. G.* 5 (1896): 167–178. **Haug.**

Contribution à l'étude des lignes directrices de la chaîne des Alps. Par M. E. Haug. *With Map.*

A geographical study guided by geological divisions, and illustrated by a map showing in colour the anticlinal and synclinal axes which make up the chain.

Austria—Pelagosa. *Deutsche Rundschau G.* 18 (1896): 159–171. **Groller.**

Die Inselgruppe Pelagosa im Adriatischen Meere. Geschildert von M. Groller v. Mildensee. *With Map and Illustrations.*

Description of a visit to Pelagosa, introduced by some historical notes about the island.

Bay of Biscay—Currents. *Ann. Hydrographie* 23 (1895): 427–439. **Dinklage.**

Stromversetzungen vor der Bucht von Biscaya, auf dem Dampferwege von Ouessant nach dem Kap Finisterre. Von L. E. Dinklage.

Belgium—Aische-en-Refail. **Verhelst.**

B.S.R. Belge G. **19** (1895): 201-228, 289-332, 543-556.

Étude de Géographie locale. Aische-en-Refail. Par Ed. Verhelst. *With Plan.*

Caucasus. *Verh. Ges. Erdk. Berlin* **22** (1895): 602-611. **Arzruni.**

Herr Prof. Andreas Arzruni: Reise nach Süd Kaukasien.

Account of a journey in Southern Caucasia in 1894, with the special object of studying volcanic phenomena.

Caucasus—Central. *C.R* **121** (1895): 839-842. **Fournier.**

Sur la géologie et la tectonique du Caucase central. Note de M. E. Fournier.

Caucasus—Daghestan. **Radde and Koenig.**

Der Nordfuss des Dagestan und das vorlagernde Tiefland bis zur Kuma. Von Dr. G. Radde und E. Koenig.—Dr. A. Petermann's 'Mitteilungen,' Ergänzungsheft No. 117. Gotha: Justus Perthes, 1895. Size 11 × 8, pp. iv. and 66. *Map.*

This will be specially noticed in the *Journal*.

Danube. **Schweiger-Lerchenfeld.**

Die Donau als Völkerweg, Schiffahrtsstrasse und Reiseroute. Von Amand Freiherr v. Schweiger-Lerchenfeld. Vienna, etc.: A. Hartleben, 1896. Size 9½ × 7, pp. viii. and 950. *Maps and Illustrations. Price* 17*s.* 6*d.*

A popular and richly illustrated treatise on the Danube from its source to the sea, dealing with the geographical, historical, and picturesque aspects of the river-basin, and with the navigation and trade of the river itself.

Faröes. **Andersen.**

Færøerne, 1600-1709 Af N. Andersen. Copenhagen: G. E. C. Gad, 1895. Size 8½ × 5½, pp. 460. *Map and Plan. Price* 5*s.* 6*d.*

The history of the Faröes in the seventeenth century, with notes on the geographical conditions and the trade of the islands.

France—Anthropology. *Ann. G.* **5** (1896): 156-166. **Collignon.**

De l'Auvergne à l'Atlantique, étude anthropologique. Par M. le Dr. R. Collignon. *With Maps.*

France—Demography. *B.S. d'Anthrop. Paris* (4) **5** (1894): 648-684. **Chervin**

La situation démographique de la France en Europe. Par M. le Dr. Chervin.

A study of the fluctuations of population in France.

France—Tours. *S.G. Tours, Revue* **12** (1895): 13-35. **Chauvigné.**

Géographie historique et descriptive de la Champagne tourangelle et de la Brenne. Par Auguste Chauvigné.

France—Vosges—The Faucilles. *B.S.G. de l'Est* (1895): 88-97. **Fournier.**

Géographie régionale. Les Faucilles. Par M. le Dr. A. Fournier.

Germany—Alsace-Lorraine. **Boller.**

Untersuchungen über die Bodentemperaturen an den forstlich-meteorologischen Stationen in Elsass-Lothringen. Von Wilhelm Boller.—Geographische Abhandlungen aus den Reichslanden Elsass-Lothringen . . . herausgegeben von Prof. Dr. G. Gerland. Zweites Heft. Pp. 185-266. Stuttgart: E. Schweizerbart, 1895. Size 9½ × 6. *Plates.*

Germany—Alsace—Rainfall. **Rubel**

Die Niederschlagsverhältnisse im Ober-Elsass. Von Otto Rubel.—Geographische Abhandlungen aus den Reichslanden Elsass-Lothringen . . . herausgegeben von Prof. Dr. G. Gerland. Zweites Heft. Pp. 267-358. Stuttgart: E. Schweizerbart, 1895. Size 9½ × 6. *Map.*

Germany—East Prussia. *G.Z.* **1** (1895): 679-685. **Tetsner.**

Zur Besiedelung und Germanisierung Deutsch-Litauens. Von F. Tetsner.

Germany—Forests. **Höck.**

Laubwaldflora Norddeutschlands. Eine pflanzen-geographische Studie. Von Dr. F. Höck.—Forschungen zur deutschen Landes- und Volkskunde . . . herausgegeben von Dr. A. Kirchhoff. Neunter Band. Heft 4. Stuttgart: J. Engelhorn, 1896. Size 9½ × 6½, pp. [67].

On the deciduous forests of Northern Germany.

Germany—Lower Vistula. *Deutsche Rundschau G.* **18** (1895): 49-61. **Zweck.**

Die untere Weichsel und ihre neue Mündung bei Schiewenhorst. Von Dr. A. Zweck. *With Map and Illustration.*

A full account of the recent change in the Vistula, brought about by the new artificial channel. See vol. vi. p. 565.

Germany—Saxony. *Deutsche G. Blätter* **18** (1895): 309–322. **Gebauer.**

Die Waldungen des Konigreichs Sachsen. I. Von Heinrich Gebauer. *With Map.*

On the forests of Saxony.

Holland to Russia. **Jefferson.**

Awheel to Moscow and back. The Record of a Record Cycle Ride. By Robert L. Jefferson. With a Preface by Lieut.-Colonel A. R. Savile. London: Low & Co., 1895. Size 8 × 5½, pp. xii. and 172. *Illustrations. Price* 2*s. Presented by the Publishers.*

The sole object of the writer was to make the journey from London to Moscow and back on a bicycle in fifty days. It reflects credit on the forbearance of innkeepers and wayfaring peasants, and on the toleration of the Russian police, that he succeeded in doing so.

Iceland—Reykjanes. *Globus* **69** (1896): 77–81. **Thoroddsen.**

Ergebnisse von Dr. Thoroddsen's Forschungen auf Reykjanes. Aus dem Isländischen im Auszuge mitgeteilt. Von M. Lehmann-Filhés. *With Map.*

Italy—Sicily. **Vuillier.**

Tour du Monde **67** (1894): 1–64; **68** (1894): 289–336; **1** *N.S.* (1895): 133 . . . 553.

La Sicile, impressions du présent et du passé. Par M. Gaston Vuillier. *With Illustrations.*

Lipari Islands. **Ludwig Salvator.**

Die Liparischen Inseln. Fünftes Heft: Filicuri. Prague: H. Mercy, 1895. Size 16½ × 13, pp. viii. and 38. *Map and Illustrations. Presented by the Archduke Ludwig Salvator.*

The luxurious typography of this work has already been commented upon; the geographical bearing will be noticed in a special review when the book is completed.

Mediterranean—Malta. *Deutsche Rundschau G.* **18** (1895): 1–6; 61–68. **Lenz.**

Die Maltagruppe. Von Oskar Lenz. *With Illustrations.*

Norway—Finmarken. **Reusch.**

Folk og natur i Finmarken. Af Hans Reusch (Med et tillæg: Uddrag af Keilhaus "Reise i Ost- og Vest-Finmarken"). Christiania: T. O. Brøgger, 1895. Size 9½ × 6½, pp. 176. *Map and Illustrations. Presented by the Author.*

Russia—Geological History. *Ann. G.* **5** (1896): 179–192. **Karpinsky.**

Sur le caractère général des mouvements de l'écorce terrestre dans la Russie d'Europe. Par M. Karpinsky. *With Illustrations.*

Abstract of a paper published in Russian in the *Bulletin* of the Academy of Sciences of St. Petersburg, 1894, illustrated by numerous sketch-maps, showing from geological evidence the distribution of land and water over Russia at different geological epochs.

Spain—Historical. *Nouv. Archives Miss. Sci.* **6** (1895): 597–635. **Dezert.**

Mission en Espagne (1890). Les archives des Indes à Séville, les archives du consulat de Cadiz (1894). Par M. Desdevises du Dezert.

Sweden—Gothland Flora. **Sernander.**

Studier öfver den Gotländska vegetationens utvecklingshistoria. Af Rutger Sernander. Upsala, 1894. Size 10 × 6½, pp. 112.

Sweden—Magnetic Conditions. **Carlheim-Gyllenskold.**

Bihang K. Svenska Vet.-A. Handlingar **20** (1895): 1–32.

Déterminations des éléments magnétiques effectuées sur la glace de quelques lacs en Suède pendant l'hiver, 1889. Par V. Carlheim-Gyllenskold.

The magnetic observations here discussed were made on the ice in the middle of lakes during winter, so as to be as far as possible from any local disturbances.

United Kingdom, England—Surrey. **Barrett.**

Surrey: Highways, Byways, and Waterways. Written and Illustrated by C. R. B. Barrett. London: Bliss, Sands, & Foster, 1895. Size 10½ × 8, pp. xvi. and 252. *Illustrations.*

United Kingdom—Ireland. *P.R. Irish A.* (3) **3** (1895): 587–649. **Browne.**

The Ethnography of the Mullet, Inishkea Islands, and Portacloy, County Mayo. By Charles R. Browne, M.D. *With Plates.*

United Kingdom—Meteorology.

Official No. 117. Meteorological Observations at Stations of the Second Order for the year 1891. With Frontispiece, Map, and Appendix, giving results for certain Stations for the 15 years 1876–1890. Published by direction of the

Meteorological Council. London: Eyre and Spottiswoode, 1895. Size 12½ × 10. *Price* 30*s*. *Presented by the Meteorological Office.*

ASIA.

Asia—Geomorphology. *G.Z.* **2** (1896): 7–25. **Naumann.**

Die Grundlinien Anatoliens und Centralasiens. Von Dr. Edmund Naumann. *With Maps.*

A comparison between the fundamental structural lines of Asia Minor and the main mass of Asia.

Asia Minor. **Diest and Anton.**

Neue Forschungen im nordwestlichen Kleinasien. Von W. v. Diest, und M. Anton, mit Beiträgen von Leutnant Graf Götzen, Dr. A. Körte und Dr. G. Türk. —Dr. A. Petermann's 'Mitteilungen.' Ergänzungsheft Nr. 116. Gotha: Justus Perthes, 1895. Size 11 × 7½, pp. 132. *Maps. Price* 8 *mark.*

This will be specially noticed.

Asia Minor. **Naumann.**

Reisen in Anatolien. Von Dr. Edmund Naumann. Sonder-Abdruck aus Band LXVII. Nr. 18 u. 19 des Globus. Brunswick: F. Vieweg & Sohn, [1895]. Size 12½ × 9½, pp. 12. *Maps and Illustrations. Presented by the Author.*

Asia Minor—Phrygia. *Nouv. Archives Miss. Sci.* **6** (1895): 425–596. **Radet.**

En Phrygie. Rapport sur une mission scientifique en Asie Mineure (août—septembre 1893). Par M. Georges Radet. *With Maps and Plates.*

Central Asia. **Dutreuil de Rhins and Grenard.**

A travers le Monde (*Tour du Monde*) (1896): 1–4.

Mission scientifique Française dans la Haute-Asie. [M. Dutreuil de Rhins and M. Fernand Grenard.] *With Map and Illustrations.*

Central Asia—Bokhara. *Rev. Scientifique* (4 S.) **5** (1896): 145–146. **Laurent.**

Une visite à la prison de Bokhara (Asie Centrale). Par M. Émile Laurent.

China—Climate. *Deutsche Rundschau G.* **18** (1895): 97–107. **Krebs.**

Das Klima Ost-Asiens in weltwirthschaftlicher und sanitärer Beziehung. Von Wilhelm Krebs. *With Maps.*

The maps show the annual rainfall of China for several representative years.

China—Yang-tse-Kiang. *Verh. Ges. Erdk. Berlin* **22** (1895): 672–675. **Hirth.**

Herr Prof. Friedrich Hirth. Zwei Jahre am Yangtze-Kiang.

China—Yunnan. *Ann. G.* **5** (1896): 234–241. **Roux.**

Lettre sur le Yunnan. Par M. Émile Roux. *With Map.*

M. Roux was the companion of Prince Henri d'Orleans in his recent remarkable journey, and this letter includes an account of their trip from January 26, 1895, when they left Hanoi, until May 26, when they reached Tali-fu.

Eastern Asia. *Ann. G.* **5** (1896): 216–233. **Chavannes.**

Les résultats de la guerre entre la Chine et le Japon. Par M. E. Chavannes.

India—Botanical Survey. **Gammie and Woodrow.**

Records of the Botanical Survey of India. Vol. i. No. 5. Report on a Botanical Tour in the Lakhimpur District, Assam, by G. A. Gammie. Ditto. No. 6. Notes on a Journey from Poona to Nagotna, by G. Marshall Woodrow. Calcutta, 1895. Size 10 × 6½.

India—Census. **Abbott.**

Census of India, 1891. Vol. xxvi. Rajputana. Part i. The Report, Imperial Tables, and Supplementary Returns. Part ii. The Provincial Tables and Remarks. By Lieut.-Colonel H. B. Abbott. Calcutta, 1892. Size 13 × 8½, pp. (Part i.) 124 and cccx., *Maps;* (Part ii.) 16 and lxxxviii.

India—Cochin. **Menon.**

Report on the Census of Cochin, 1891 A.D.–1066 M.E. In two parts. By C. Achyuta Menon, B.A., Superintendent of Census Operations. The Cochin Government Press, 1893. Size 13 × 8½, pp. viii., 146, 152, and xxii. *Presented by the Secretary of State for India.*

India—Kashmir. *J.E. India Association* **27** (1896): 22–32. **Lawrence.**

Kashmir. By Walter R. Lawrence.

India—Manipur. **Johnstone.**

My Experiences in Manipur and the Naga Hills. By the late Major-General Sir

James Johnstone, K.C.S.I. With an Introductory Memoir. London: Low & Co., 1896 [1895]. Size 9 × 6, pp. xxviii. and 286. *With Portrait, Map, and Illustrations. Price* 16*s*. *Presented by the Publishers.*

This will be noticed with other books on India.

India—Punjab. **Gore.**

Lights and Shades of Hill Life in the Afghan and Hindu Highlands of the Punjab. A Contrast. By F. St. J. Gore. London: John Murray, 1895. Size 9½ × 6½, pp. xx. and 270. *Maps and Illustrations. Price* 31*s*. 6*d*. *Presented by the Publisher.*

This volume, which is distinguished by exceptionally fine illustrations, will be noticed, together with other recent books on India.

India—Punjab—Lahore. **Latif.**

Lahore: its History, Architectural Remains, and Antiquities, with an account of its Modern Institutions, Inhabitants, their Trade, Customs, &c. By Syad Muhammad Latif, Khan Bahadur. Lahore: 1892. Size 10 × 6½, pp. xiv., vi., iv., 426, and xii. *Plan and Illustrations. Presented by the Author.*

India—Survey of India Department.

General Report on the Operations of the Survey of India Department administered under the Government of India during 1893–94. Prepared under the direction of Colonel Sir Henry R. Thuillier, Surveyor-General of India. Calcutta, 1895. Size 13 × 8½, pp. vi., 134, and cxviii. *Maps and Frontispiece. Presented by the Surveyor-General of India.*

The work of the Survey recorded in this report was noticed in the *Journal*, vol. vi. (1895), pp. 27–31.

India—Travencore. **Aiya.**

Report on the Census of Travancore taken . . . on the 26th February, 1891—16th Masy 1066 M.E. along with the Imperial Census of India. By V. Nagam Aiya, B.A., etc. Vol. i., Report: vol. ii., Appendix. Madras: Addison & Co., 1894. Size 8½ × 5½, pp. (vol. i.) xx. and 796; (vol. ii.) 4 and 1056. *Maps, Diagrams, etc. Presented by the Secretary of State for India.*

These volumes give the statistical tables of the Census of Travancore, illustrated by diagrams and population maps, and accompanied by an elaborate report on the people, containing much information as to the manners and customs of the various castes.

Japanese Alps. **Weston.**

Exploration in the Japanese Alps, 1891–94. From the *Geographical Journal* for February, 1896. By the Rev. Walter Weston, M.A. Size 10 × 6½, pp. [26]. *Map and Illustrations.*

Japanese Architecture. **Levieux.**

Essai sur l'Architecture Japonaise. Par Fernand Levieux. Extrait du 'Bulletin de la Société Royale Belge de Géographie,' 1895, No. 3. Brussels, 1895. Size 9 × 6, pp. 26. *Illustrations. Presented by the Author.*

Japan—Formosa. *Aus allen Welttheilen* **27** (1895): 33–40: 66–76. **Panckow.**

Die Bevölkerung Formosas. Von Hellmuth Panckow. *With Illustrations.*

Java—Batavia. *Ann. Hydrographiques* (2) **17** (1895): 80–90. **Oudemans.**

Longitude de Batavia. Par J.-A.-C. Oudemans.

This paper is accompanied by appendices giving the longitudes from recent determinations of a number of important places in the far East.

Korea. *Globus* **68** (1895): 381–383. **Arnous.**

Gewichte, Masse, Kompass und Zeiteinteilung in Korea. Von H. G. Arnous, Fusang.

On the units of measurement in Korea.

Malay Archipelago and Pacific Islands. **Schneider.**

Deutsche G. Blatter **18** (1895): 372–386.

Carl Ribbes Reisen in der Südsee. Von Professor Dr. Oskar Schneider.

Notes on the journeys of Herr Carl Ribbe for natural history observations in the Malay archipelago and neighbouring islands of the Pacific.

Malay Peninsula. **Swettenham.**

Malay Sketches. By Frank Athelstane Swettenham. London: John Lane, 1895. Size 8 × 5½, pp. xii. and 290. *Price* 5*s*. *Presented by the Publisher.*

The author states that "These pages contain no statistics, no history, no geography, no science real or spurious, no politics, no moralizing, no prophecy,—only an attempt to awaken an interest in an almost undescribed but deeply interesting people." This in a series of bright essays he succeeds in doing; but geography is not exclusively a matter of maps and measurements, and unconsciously, it may be, Mr. Swettenham furthers geography not a little by his vivid portraiture of the people and their surroundings.

Persia. **De Morgan.**

Mission Scientifique en Perse. Par J. de Morgan. Tome Second. Études géographiques. Paris: E. Leroux, 1895. Size 11½ × 9, p. 334. *Illustrations.*

This book will be specially noticed in the *Journal*.

Siam. **Smyth.**

Notes on a Journey to some of the South-Western Provinces of Siam. By H. Warington Smyth, LL.B, etc. From the *Geographical Journal* for November and December, 1895. Size 10 × 6½, pp. 44. *Map and Illustrations.*

Siberia—Surgut. *Deutsche Rundschau G.* **18** (1895): 114–123. **Stenin.**

Der Kreis Surgut in West-Sibirien. Von Peter von Stenin in St. Petersburg. *With Illustrations.*

Translated from vol. 10 of the publication of the Western Siberian branch of the Imperial Russian Geographical Society.

Straits Settlement. *Imp. and Asiatic Quarterly Rev.* (3) **1** (1896): 90–110. **Pickering.**

The Straits Settlement.—I. Its Early History. By W. A. Pickering, C.M.G.

Sumatra—Toba Lake. **Pleyte.**

De Verkenning der Bataklanden. Eene Bijdrage tot de Geschiedenis der Ontdekking van het Toba-Meer. Door C. M. Pleyte Wzn. Overgedrukt uit het "Tijdschrift van het Koninklijk Nederlandsch Aardrijkskundig Genootschap, Jaargang, 1895." Leiden: E. J. Brill, 1895. Size 9½ × 6, pp. 42. *Map. Presented by the Author.*

Tibet—Kuen-lun. *M.G. Ges. Wien* **38** (1895): 497–526. **Bogdanowitch.**

Einige Bemerkungen über das System des Kwenlun. Von K. Bogdanowitch. *With Map.*

Turkey in Asia—Kerbela. *Blackwood's Mag.* (1896): 287–293. ———

A Pilgrimage to Kerbela.

The visit to Kerbela here described took place during Muharran when the fanaticism of the Shiah Mohammedans reaches a climax.

AFRICA.

African Explorers. *Imp. and Asiatic Quarterly Rev.* (3) **1** (1896): 75–89. **Oliver.**

The African Pioneers. With a Map of Île St. Marie. By Captain S. Pasfield Oliver.

Algeria and Tunis. *Nouv. Archives Miss. Sci.* **6** (1895): 399–424. **Gain.**

Mission scientifique de physiologie végétale en Algérie et en Tunisie.—Recherches relatives à l'influence de la sécheresse sur la végétation. Par M. Edmond Gain.

This will be noticed in the Monthly Record.

Canary Islands—Teneriffe. **Meyer.**

Die Insel Tenerife. Wanderungen im canarischen Hoch- und Tiefland. Von Dr. Hans Meyer. Leipzig: S. Hirzel, 1896. Size 9½ × 6½, pp. viii. and 328. *Maps and Illustrations. Price* 8*s.*

This book will be specially noticed.

Central Africa. **Elliot.**

A Naturalist in Mid-Africa, being an account of a Journey to the Mountains of the Moon and Tanganyika. By G. F. Scott-Elliot. London: A. D. Innes & Co., 1896. Size 9½ × 6, pp. xvi. and 414. *Maps and Illustrations. Price* 16*s. Presented by the Author.*

This work will be specially noticed.

Central Africa. *B.S.R. Belge G.* **19** (1895): 557–576. **Götzen.**

La traversée de l'Afrique centrale. Par le Lieutenant Comte von Götzen.

Congo State. *B.S.R. Belge G.* **19** (1895): 397–428, 513–542. **De la Kéthulle.**

Deux années de résidence chez le sultan Rafai. Voyage et exploration au nord du Mbomou. Par le Lieutenant Charles de la Kéthulle de Ryhove.

Congo State. *B.S.R. Belge G.* **19** (1895): 109–134, 251–276, 333–358, 577–609. **Poskin.**
Climatologie du Congo. Par le Dr. A. Poskin.
A valuable contribution to the climatology of tropical Africa.

Egypt—Historical. **Mahaffy.**
The Empire of the Ptolemies. By J. P. Mahaffy. London: Macmillan & Co., 1895. Size 8 × 5½, pp. xxvi. and 534. *Price* 12*s.* 6*d.* *Presented by the Publishers.*
A history of Egypt under the Ptolemies.

French West Africa—Sudan. **Archinard.**
Le campagne 1892-1893 au Soudan français: Rapport de M. le colonel Archinard. Supplement to the *Bulletin du Comité de l'Afrique Française.* Sixième Année. No. 1. January, 1896. Pp. 1–36. Paris. Size 12½ × 9½. *Map and Portrait.*

German East Africa. *M. deutsch. Schutzgeb.* **8** (1895): 283–310. **Widenmann.**
Bericht über die klimatischen und gesundheitlichen Verhältnisse von Moshi am Kilimandjaro. Von Dr. Widenmann.

German Policy in Africa. *Nineteenth Century* (1896): 240–248. **Gregory.**
The proposed German Barrier across Africa. By J. W. Gregory. *With Sketch-Map.*

German South-West Africa. *Globus* **68** (1895): 384–385. **Brincker.**
Zur Namenkunde von Deutsch-Süd-Westafrika. Missionar a. D., P. H. Brincker. Stellenbosch.

German West Africa—Kamerun. *M. deutsch. Schutzgeb.* **8** (1895): 277–280. **Conrau.**
Ueber das Gebiet zwischen Mundame und Baliburg. Aus einem Briefe von G. Conrau.

German West Africa—Togo. *M. deutsch. Schutzgeb.* **8** (1895): 231–271. **Doering.**
Reiseberichte von Premierlieutenant v. Doering aus den Jahren 1873 bis 1895. *With Map.*

Madagascar. *B.S. normande G.* **17** (1895): 57–75. **Mager.**
Les peuples de Madagascar. Par M. Henri Mager. *With Map.*

Madagascar. *B.S.G. de l'Est* (1895): 123–145. **Martineau.**
Madagascar. Conférence faite à la Société. Par M. Martineau.

South Africa. **Balfour.**
Twelve Hundred Miles in a Waggon. By Alice Blanche Balfour. With Illustrations by the Author. London: E. Arnold, 1895. Size 9 × 6, pp. xx. and 266. *Map. Price* 16*s.* *Presented by the Publisher.*
This is a lively and entertaining account of a pleasure trip by way of Mafeking, Victoria, Salisbury, and Chimoia to the Pungwe river and Beira. The illustrations (thirty-eight in number) by the author, though sketchy, give a very truthful and accurate idea of the country and people. No attempt is made to describe either the people or country systematically, and most of the interesting problems of Mashonaland are, apparently of set purpose, disregarded altogether; still, a very clear idea is given of ordinary bullock-waggon travelling, and the incidental notes regarding Boers and natives are true to life.

South Africa. *Blackwood's Mag.* (1895): 121–134. ———
The Big Game of South Africa.

South Africa. **Kirby.**
In Haunts of Wild Game. A Hunter-Naturalist's Wanderings from Kahlamba to Libombo. By Frederick Vaughan Kirby (Maqaqamba). Edinburgh and London: W. Blackwood & Sons, 1896. Size 9½ × 7, pp. xvi. and 576. *Portrait, Map, and Illustrations. Price* 25*s.* *Presented by the Publishers.*
A stirring story of sport, admirably illustrated, and provided with a game-map of Kahlamba and Libombo, in the north-east of the Transvaal and the neighbouring portion of Portuguese East Africa. The map distinguishes the bush-veldt proper, the lion and low country leopard district of the veldt, the foot-hills or Kloof country, and the Krantz country, in each of which there is a special type of game. The tsetse fly boundary is approximately shown.

South Africa—Mashonaland. **Knight-Bruce.**
Memories of Mashonaland. By G. W. H. Knight-Bruce. London: E. Arnold,

1895. Size 8½ × 6, pp. 242. *Frontispiece. Price* 10*s.* 6*d. Presented by the Publisher.*

The rise of the mission in Mashonaland and questions of missionary policy form the larger part of Bishop Knight Bruce's 'Memories.' There are two interesting chapters dealing with the country and the habits of the people, an appreciation of Khama and a short account of the Matabele war. The Bishop had very exceptional opportunities and long experience, and his opinions should therefore be studied by anthropologists. There is neither map nor index.

Sudan—Niam-Niam Language. **Colombaroli.**

Premiers éléments de langue A. Sandeh vulgairement appelée Niam-Niam, recueillis et co-ordonnés par A. Colombaroli. Extrait du Bulletin de la Société Khédiviale de Géographie, IV^e^ serié, No. 6. Cairo: Imp. Nationale, 1895. Size 9 × 6, pp. 100. *Presented by the Author.*

This grammar and vocabulary of the language of the Niam-Niams has been constructed by the author from his long residence amongst the people.

Tripoli and the Sudan. *Ann. G.* **5** (1896): 193-201. **d'Attanoux.**

Tripoli et les voies commerciales du Soudan. Par M. J. Bernard d'Attanoux. *With Illustration.*

Tropical Africa. **Sitta.**

Prof. Pietro Sitta. La colonizzazione dell' Africa tropicale al VI. Congress Internazionale di Geografia tenuto in Londra dal 26 luglio al 3 agosto 1895. Estratto dalla *Riforma Sociale*, Fasc. viii., anno ii, vol. iv. Turin: Roux Frassati & Co., 1895. Size 10 × 6½, pp. 16.

A report of the discussion on Tropical Africa, introduced by Sir John Kirk at the Sixth International Geographical Congress.

West Africa—Niger. *Rev. Française* **21** (1896): 41-44. **Demanche.**

La France recule au Niger: les postes d'Yola et d'Arenberg. Par G. Demanche.

West Africa—Upper Niger. *Church Miss. Intelligencer* **47** (1896): 28-30. **Nott.**

The Upper Niger and Soudan. By Lewis H. W. Nott.

NORTH AMERICA.

Biological Geography. *Texas A. Sci.* **1** (1895): 71-96. **Townsend.**

On the Bio-Geography of Mexico, Texas, New Mexico, and Arizona, with Special Reference to the Limits of the Life Areas, and a Provisional Synopsis of the Bio-Geographic Divisions of America. By C. H. Tyler Townsend.

Canada—Geological Survey. ———

Geological Survey of Canada, George M. Dawson, Director. List of Publications of the Geological Survey of Canada. Ottawa, 1895. Size 10 × 6½, pp. 52.

Canada—Statistical Year Book. ———

The Statistical Year-Book of Canada for 1894. Tenth Year of Issue. Issued by the Department of Agriculture. Ottawa, 1895. Size 8½ × 6½, pp. vi. and 1134. *Map and Diagram. Presented by the High Commissioner for Canada.*

A specially designed map shows in a striking way the central position of the Dominion of Canada in the British Empire.

United States. ———

U.S. Department of Agriculture. Weather Bureau. Report of the Chief of the Weather Bureau, 1893. Washington, 1894. Size 12 × 9½, pp. 320. *Plans and Illustrations.*

United States—Alaska. *Science (N.S.)* **3** (1896): 37-45, 87-93. **Dall.**

Alaska as it was and is, 1865-1895. (The annual presidential address, delivered before the Philosophical Society of Washington, December 6, 1895, by W. H. Dall.)

United States—Arkansas. *P. Boston S. Nat. Hist.* **26** (1895): 479-488. **Marbut.**

The Geographic Development of Crowley's Ridge. By C. F. Marbut. *With Diagrams.*

This is one of the studies carried out under the guidance of Professor W. M. Davis, of Harvard, on the lines made familiar by his article on "The development of certain English rivers" in the *Geographical Journal*, vol. v. (1895), p. 127.

United States—Carolina. *P. Boston S. Nat. Hist.*, **26** (1895): 489–497. **Abbe.**

Remarks on the Cuspate Capes of the Carolina Coast. By Cleveland Abbe, junr. *With Illustrations.*

A student's study of the characteristic curves of a low detrital coast. It will be referred to in the Monthly Record along with Güttner's treatise on the 'Morphology of Coasts.'

United States—Connecticut. *American J. Sci.* (4) **1** (1896): 1–13. **Davis.**

The Quarries in the Lava Beds at Meriden, Conn. By William M. Davis.

The paper is illustrated by some interesting sections showing the relations between geological and topographical features.

United States—Eastern States. *P. Boston S. Nat. Hist.* **26** (1895): 404–414. **Bangs.**

The geographical distribution of the eastern races of the cotton-tail (*Lepus sylvaticus*, Bach.); with a description of a new sub-species, and with notes on the distribution of the northern hare (*Lepus Americanus*, Erxl.) in the east. By Outram Bangs.

An essay on the relation between species and environment.

United States—Lower Mississippi. **Griswold.**

P. Boston S. Nat. Hist. **26** (1895): 474–479.

Origin of the Lower Mississippi. By L. S. Griswold. *With Map.*

Speculations and deductions as to the changes which have taken place in the region now traversed by the Lower Mississippi.

United States—Massachusetts. *P. Boston S. Nat. Hist.* **26** (1895): 500–505. **Tilton.**

On the south-western part of the Boston Basin. By J. L. Tilton. *With Map.*

The "basin" referred to is an area of sedimentary rocks, surrounded by rocks of igneous origin.

United States—Minnesota—Rainy Lake Region. **Winchell and Grant.**

Geolog. and Nat. Hist. Survey Minnesota, **23** *Rep.*, 1894 (1895): 36–105.

Preliminary Report on the Rainy Lake gold region. By H. V. Winchell and U. S. Grant.

United States—Missouri Geological Survey. ——

Missouri Geological Survey. Vols. iv. and v., Palæontology of Missouri (Parts i. and ii.), by Charles Rollin Keyes. Vols. vi. and vii., Lead and Zinc Deposits (Sections 1 and 2), by Arthur Winslow, assisted by James D. Robertson. Jefferson City, 1894. Size 10 × 7, pp. (vol. iv.) 272, (vol. v.) 266, (vols. vi. and vii.) xxii. and 764. *Maps and Plates. Presented by the Missouri Geological Survey.*

United States—Texas. *Texas A. Sci.* **1** (1895): 25–60. **Dumble.**

The Soils of Texas—A Preliminary Statement and Classification. By E. T. Dumble, State Geologist.

The classification is accompanied by a map showing the main regions into which the state is divided with respect to soil.

United States—Virginia—Indians. **Hendren.**

Johns Hopkins' University Studies. Thirteenth Series, xi.–xii. Government and Religion of the Virginia Indians. By Samuel Rivers Hendren, PH.D. Baltimore: The Johns Hopkins Press, 1895. Size 9½ × 6, pp. 64.

SOUTH AMERICA.

Argentine Republic—Buenos Ayres. **Frers.**

Provincia de Buenos Aires. Memoria presentada a la Honorable Legislatura por el Ministro de Obras Públicas Dr. Emilio Frers, 1894–1895. La Plate, 1895. Size 10½ × 7, pp. cxl. and 380. *Maps. Presented by the Museo de la Plata, Buenos Ayres.*

Argentine—Pilcomayo. **Storm.**

El Rio Pilcomayo y el Chaco Boreal. Viajes y exploraciones por Olaf J. Storm. Buenos Aires, 1892. Size 9 × 6, pp. 152. *Map and Illustrations. Presented by the Author.*

British Guiana and Venezuela Boundary. *Nineteenth Century* (1896): 185–188. **Bolton.**

The Facts about the Venezuela Boundary. By John Bolton. *With Map.*

Central America—Nicaragua. *P. Boston S. Nat. Hist.* **26** (1895): 546–557. **Crawford.**

Cerro Viejo and its volcanic cones. By J. Crawford.

Chile. ——

Anuario hidrográfico de la Marina de Chile. Año 18. Santiago de Chile, 1895. Size 10 × 7, pp. 32 and 480. *Plates. Presented by the Chilian Hydrographic Department.*

Chile—Chillan *Globus* **69** (1896): 60–62, 74–77. **Reiche.**

Die Thermen von Chillan in Chile. Von Dr. phil. K. Reiche in Constitucion, Chile.

Nicaragua Canal. *J. Tyneside G.S.* **3** (1895): 151–160. **Colquhoun.**

Lecture on Nicaragua and its Canal. By A. R. Colquhoun. *With Illustrations.*

Peru. **Middendorf.**

Peru. Beobachtungen und Studien über das Land und seine Bewohner während eines 25-jährigen Aufenthalts. Von E. W. Middendorf. III. Band. Das Hochland von Peru. Berlin: R. Oppenheim, 1895. Size 10 × 7, pp. xvi. and 604. *Map and Illustrations. Price 20 mark. Presented by the Publisher.*

After a short general introduction to the mountainous region of Peru, the author considers the highlands of Central Peru, the highlands of Northern Peru, Titicaca lake, and the highlands of Southern Peru. The volume is rich in admirable illustrations. The previous parts dealt with Lima and the coast lands.

Peru. ——

Bureau of the American Republics, Washington, U.S.A., Peru. Bulletin No. 60. 1892. [Revised to May 1, 1895.] Size 9½ × 6, pp. 146. *Map and Illustrations.*

This little volume gives a brief but well-arranged description of Peru, special prominence being given to the financial and agricultural condition of the country, to mining, political divisions, and to commercial statistics.

Peru and the Amazon. **Schütz-Holzhausen.**

Der Amazonas. Wanderbilder aus Peru, Bolivia und Nordbrasilien. Von Damian Freiherrn von Schütz-Holzhausen. Zweite, durchgesehene und erweiterte Auflage, unter besonderer Berücksichtigung der vom Verfasser gegründeten tirolisch-rheinischen Kolonie Pozuzo: herausgegeben von Adam Klassert. Freiburg im Breisgau: Herdersche Verlagshandlung, 1895. Size 10 × 6½, pp. xx. and 444. *Maps, Portrait, and Illustrations Price 7s.*

The story of the travels in South America of the founder of the German colony at Pozuzo in 1856.

Tierra del Fuego. **Spears.**

The Gold Diggings of Cape Horn. A study of life in Tierra del Fuego and Patagonia. By John R. Spears. New York and London: G. P. Putnam's Sons, 1895. Size 8½ × 6, pp. x. and 320. *Map and Illustrations. Presented by the Author.*

A pleasantly written travel-sketch by a New York journalist. It gives a fresh and lively description of present-day life in the southern corner of South America.

Venezuelan Boundaries. *Globus* **69** (1896): 53–55. **Sievers.**

Die Grenzen Venezuelas. Von Prof. W. Sievers; Giessen. *With Map.*

West Indies. *B.S. normande G.* **17** (1895): 165–178. **Vibert.**

Exploration aux Antilles. Par M. Paul Vibert.

This article includes notes of a visit to Haiti.

CENTRAL AND SOUTH AMERICA.

West Indies—Jamaica. *J.S. Arts* **44** (1896): 103–130. **Cundall.**

Jamaica in the Past and Present. By Frank Cundall. *With Map and Illustrations.*

West Indies—Jamaica. **Norman.**

Australasian Association for the Advancement of Science. Brisbane. 1895. A West India Island. By General Sir H. W. Norman, G.C.B., etc. Size 9 × 5½, pp. 14. *Presented by the Author.*

West Indies. *G.Z.* **2** (1896): 1–6. **Deckert.**

Politisch-geographische Betrachtungen über Westindien, unter besonderer Berücksichtigung von Cuba. Von Dr. Emil Deckert. I. Allgemeiner Ueberblick.

AUSTRALASIA AND OCEANIC ISLANDS.

Australia and Oceania. **Sievers.**

Australien und Ozeanien. Eine allgemeine Landeskunde von Professor Dr Wilhelm Sievers. Leipzig: Bibliographisches Institut, 1895. Size 10½ × 7½, pp. viii. and 522. *Maps and Illustrations (including coloured plates). Price 16s.*

Australasian Colonies. **Jenks.**

The History of the Australasian Colonies (from their Foundation to the year 1893). By Edward Jenks. Cambridge: The University Press, 1895. Size 8 × 5½, pp. xvi. and 352. *Map. Price* 6*s*. *Presented by the Cambridge University Press.*

This compact little history, provided with a full index, gives a summary of Australian history in a concise but attractive form. It is a record full of lessons in geography, for the adaptation of a civilized race to the conditions of a new environment was never more clearly shown than in the colonization and development of Australia.

Australian Fungi. **McAlpine.**

Department of Agriculture, Victoria. Systematic arrangement of Australian Fungi, together with Host-index and list of works on the subject. By D. McAlpine, Government Vegetable Pathologist. Melbourne, 1895. Size 11 × 9, pp. viii. and 336. *Presented by the Government of Victoria.*

Marshall Islands. *Aus allen Welttheilen* **27** (1895): 1–11. **Kirchhoff.**

Die Marshall-Inseln. Von Professor Dr. Alfred Kirchhoff.

New Zealand—Year-Book. **Dadelszen.**

The New Zealand Official Year-Book, 1895. . . . By E. J. von Dadelszen, Registrar-General. Wellington, 1895. Size 8½ × 5½, pp. viii. and 554. *Map and Plates.*

This book contains full statistics of New Zealand, including a number of statistical diagrams of a kind likely to appeal to the understanding of intending emigrants who might not pay much attention to mere tables of figures.

PACIFIC ISLANDS.

Pacific Islands. ———

Parts of the Pacific. By a Peripatetic Parson. Illustrated from Drawings by the Author and from photographs. London: Sonnenschein & Co., 1896. Size 9 × 6, pp. xii. and 388. *Map. Price* 10*s*. 6*d*. *Presented by the Publishers.*

"The book lays no claim to being technical, but rather aims at a colloquial description of strange lands, touching upon such matters as Emigration, Missions, the Kanaka Labour Question, and the General Treatment of Natives." So the preface states the aim of this work. The places described are North Queensland, the Fiji Islands, New Zealand, the Hawaiian Islands, and the coast of North America.

Queensland. **Bicknell.**

Travel and Adventure in Northern Queensland. By Arthur C. Bicknell. With illustrations by J. B. Clark, from sketches by the author. London: Longmans & Co., 1895: size 9 × 6, pp. xvi. and 220. *Portrait. Price* 15*s*. *Presented by the Publishers.*

A somewhat minute account of the daily incidents of travelling in outlying parts of Queensland, with humorous illustrations.

Queensland Coast. **Norman.**

Captain Cook and his First Voyage round the World, 1768 to 1771; with special reference to his Exploration of the Queensland Coast. By His Excellency General Sir Henry W. Norman, G.C.B., etc. (Read at a meeting of the Society, October 25, 1895.) Reprinted from the *Proceedings and Transactions of the Royal Geographical Society of Australasia, Brisbane*, vol. xi. Size 9 × 5½, pp. 30. *Presented by the Author.*

Samoa. **Ehlers.**

Samoa die Perle der Südsee à jour gefasst von Otto E. Ehlers. Berlin: H. Paetel, 1895. Size 9 × 6½, pp. 200. *Frontispiece. Price* 3*s*.

South Australia—Northern Territory. **[Brown.]**

South Australia. Government Geologist's Report on Explorations in the Northern Territory. Adelaide, 1895. Size 13½ × 8½, pp. 34. *Maps, Plates, and Sections. Presented by the Secretary of State for the Colonies.*

This report will be the subject of a special note.

Victoria—Year-Book. ———

Victorian Year-Book, 1894. Containing a digest of the Statistics of Victoria, with references to the Statistics of the other Australian Colonies and other Countries. Twenty-first Year of Issue. Melbourne, 1895. Size 8½ × 6, pp. viii., 928, and lxxxvi. *Map. Presented by the Government of Victoria.*

Western Australia—Mining Handbook. **Woodward.**

Mining Handbook to the Colony of Western Australia, written especially for Prospectors and Strangers to the Colony who are interested in Mining. By Harry

P. Woodward, Government Geologist. 2nd Edit. Perth, 1895. Size 8½ × 5½. pp. vi. and 216. *Maps. Presented by the Author.*

The first edition was noticed in vol. 5 (1895), p. 92. The book has been extended, improved, and brought down to date.

POLAR REGIONS.

Antarctic. *Petermann's M.* **41** (1895): 291–293. **Larsen.**

Kapitän A. Larsens antarktische Forschung.

Criticisms of Dr. Wichmann's article in 'Petermann's Mitteilungen' on the Antarctic regions with reference to the translation of the Norwegian original, and the compilation of the map. A rejoinder by Dr. Wichmann is added.

Antarctic. *Deutsche G. Blätter* **18** (1895): 147–171; 322–350. **Ruge.**

Das unbekannte Südland. Von Professor Dr. S. Ruge.

Historical sketch of exploration in the southern hemisphere, and the search for the Antarctic continent.

Antarctic Continent. **Hedley.**

Considerations on the Surviving Refugees in Austral Lands of Ancient Antarctic Life. By C. Hedley. [Read before the Royal Society of N.S. Wales, August 7, 1895.] Size 9 × 6, pp. 10. *Presented by the Author.*

From biological reasoning, Mr. Hedley suggests "that during the Mesozoic or Older Tertiary, a strip of land with a mild climate extended across the south pole from Tasmania to Terra del Fuego, and that Tertiary New Zealand then reached sufficiently near to this Antarctic land, without joining it, to receive by flight or drift many plants and animals, as the Galapagos received their population from America, or the Azores theirs from Europe."

Antarctic Projects. *Verh. Ges. Erdk. Berlin* **22** (1895): 683–687. ———

Plan für eine deutsche Expedition zur Durchforschung der Süd-Polar-Region.

The official programme of the German Antarctic Exploration Committee.

Antarctic Regions—Kerguelen. **Murray.**

On the Deep and Shallow-water Marine Fauna of the Kerguelen Region of the Great Southern Ocean. By John Murray, D.Sc., etc., of the Challenger Expedition.—*Trans. of the Royal Society of Edinburgh*, vol. xxxiii. Part ii. (No. 10). Edinburgh: R. Grant & Son, 1896. Size 12½ × 9½, pp. [158]. *Map and Illustrations. Price* 12*s.* 6*d. Presented by the Author.*

This important paper will be the subject of a special note in the Monthly Record.

Arctic Seas—Tides. *T.R. Irish A.* **30** (1895): 587–596. **Haughton.**

On the Tides of the Arctic Seas. Part ix.—On the Tides of the North-Western entrance of Robeson Channel, Grinnell Land. By Rev. Samuel Haughton, M.D.

Dr. Haughton continues his laborious investigations of the tides observed on the *Alert* in the Arctic regions twenty years ago.

Polar Exploration. *G.Z.* **1** (1895): 685–691. **Drygalski.**

Der gegenwärtige Standpunkt der Polarforschung. Von Dr. Erich von Drygalski.

MATHEMATICAL GEOGRAPHY.

Geodesy—Gravity observations. **Rosén.**

Bihang K. Svenska Vet. A.-Handlingar **20** (1895): 1-34.

Untersuchungen über die Schwere in der Grube Sala im Jahre 1890. Von P. G. Rosén.

Navigation. *Ann. Hydrographiques* (2) **17** (1895): 113–158. **Guyou.**

Les Problèmes de navigation et la carte marine. Par M. E. Guyou, Capitaine de Frégate.

Photographic Surveying. *Rev. Maritime et Colon.* **127** (1895): 459–465. **Thoulet.**

De l'emploi de la photographie en océanographie. Par M. J. Thoulet.

A paper read to the Sixth International Geographical Congress.

Position at Sea. *Rev. Maritime et Colon.* **127** (1895): 449–458. **Ripol.**

Calcul rigoureux du point à la mer par deux hauteurs quelconques. Par M. J. Ripol.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Climatology. **Black.**

Summer Meteorology—Seaside, with Diagrams. By W. G. Black. Excerpt from vol. x. of the *Transactions* of the Sanitary Institute [1889]. Size 8½ × 6, pp. 16. *Presented by the Author.*

Configuration of Earth. **Lubbock.**

On the General Configuration of the Earth's Surface. By Sir John Lubbock, Bart. From the *Geographical Journal* for December, 1895. Size 10 × 6½, pp. 4.

Geomorphology—Ocean-basins. *C.R.* **121** (1895): 1113–1116. **Suess.**

Note sur l'histoire des océans. Par M. Suess.

This will be specially referred to in the Monthly Record.

Ice Motion. *J. Geology* **3** (1895): 918–934. **Case.**

Experiments in Ice Motion. By E. C. Case. *With Illustrations.*

Limnology—Lake Temperature. **Hergesell.**

Beobachtungen über die Lage der Sprungschicht der Temperatur im Weissen See bei Urbeis. Von H. Hergesell.—Geographische Abhandlungen aus den Reichslanden Elsass-Lothringen . . . herausgegeben von Prof. Dr. G. Gerland, Zweites Heft. Pp. 383–388. Stuttgart: E. Schweizerbart, 1895. Size 9½ × 6. *Plate.*

Physiography. *Educational Rev.* **10** (1895): 352–363. **Redway.**

What is Physiography? By J. W. Redway.

Mr. Redway finds that "Properly, physical geography includes only the description and distribution of landscape and surface features. Physiography, on the other hand, treats of the Science of Earth-sculpture viewed in the light of systematic processes."

Plant Distribution. *Knowledge* **19** (1896): 25–26. **Hemsley.**

Some curious facts in Plant Distribution. By W. Botting Hemsley.

Submarine Peaks. *American J. Sci.* (4) **1** (1896): 15–17. **Littlehales.**

The Form of Isolated Submarine Peaks. By G. W. Littlehales, U.S. Hydrographic Office.

This will be referred to in the Monthly Record.

Terrestrial Magnetism. **Schmidt.**

Erdmagnetismus und Erdgestalt. Von Dr. A. Schmidt.—Beiträge zur Geophysik . . . Herausgegeben von Prof. Dr. Georg Gerland. II. Band. 2–4. Hett. P. 197–210. Stuttgart: E. Schweizerbart, 1895. Size 9½ × 6. *Presented by the Publisher.*

ANTHROPOGEOGRAPHY AND HISTORY.

Chinese Studies. **Cordier.**

Fragments d'une Histoire des Études Chinoises au XVII^e^ siècle. Par Henri Cordier. Extrait du *Centenaire de l'École des langues orientales vivantes.* Paris: Imp. Nationale, 1895. Size 13 × 10, pp. 76. *Plates.*

Commercial Geography. **Ganeval and Groffier.**

Dictionnaire de Géographie Commerciale contenant sur les Marchés et Pays Commerçants du Globe, tous les Renseignements utiles aux Négociants et Industriels, etc., etc., suivi de 8 Cartes géographiques . . . Commencé par M. J.-A. Ganeval, continué par M. Valérien Philibert Groffier. Paris: C. Delagrave, 1895. Size 13 × 10, pp. x. and 800.

This is a Gazetteer of places of commercial importance, in which special prominence is given to local conditions directly affecting trade, such as tariffs, manufactures, means of communication, and markets.

Domestication of Animals. **Hahn.**

Die Haustiere und ihre Beziehungen zur Wirtschaft des Menschen. Eine geographische Studie, von Eduard Hahn. Leipzig: Duncker and Humblot, 1896 [1895]. Size 10 × 6½, pp. x. and 582. *Map. Presented by the Publisher.*

This book will be referred to in the Monthly Record.

Ethnology. **Keane.**

Ethnology. In two parts—I. Fundamental Ethnical Problems. II., the Primary Ethnical Groups. By A. H. Keane. Cambridge: The University Press, 1896.

Size 8 × 6, pp. xxx. and 442. *Illustrations.* *Price* 10*s.* 6*d.* *Presented by the Cambridge University Press.*

This volume will be specially noticed.

Historical—Columbus Letters. **Curtis.**

Field Columbian Museum. Publication 2. Vol. i. No. 2. The Authentic Letters of Columbus. By William Eleroy Curtis. Chicago, 1895. Size 10 × 6½, pp. [106]. *Facsimiles.* *Presented by the Director of the Field Columbian Museum.*

Jewish History. **Graetz.**

History of the Jews from the earliest times to the present day. By Professor H. Graetz. Specially Revised for this English Edition by the Author. Edited and in part translated by Bella Löwy. 5 vols. London: D Nutt, 1891–1892. Size 9 × 6, pp. (vol. i.) xvi. and 552, (vol. ii.) xii. and 644, (vol. iii.) xii. and 672, (vol. iv.), xii. and 752, (vol. v.) xii. and 836. *Portrait.* *Presented by F. D. Mocatta, Esq.*

Man in the Tropics. *G.Z.* 2 (1896): 25–34. **Däubler.**

Acclimatisation und Physiologie der Tropenbewohner. Von Dr. K. Däubler.

This will be noticed in the Monthly Record.

Mediæval Geography. *J.R. Asiatic S.* (1896): 57–82. **Hirth.**

Chao Ju-kua, a new source of Mediæval Geography. By F. Hirth, PH.D.

Chao Ju-kua was a Chinese author of the beginning of the thirteenth century, who wrote a 'Record of Foreign Countries,' which Dr. Hirth translates and annotates.

Migrations. *G.Z.* 1 (1895): 649–665. **Hirt.**

Die Urheimat und die Wanderungen der Indogermanen. Von Dr. Herman Hirt in Leipzig-Gohlis.

The author inclines to the North-European origin of the Indo-Germanic or Aryan race.

Towns. *G.Z.* 1 (1895): 676–678. **Schneider.**

Stadtumfänge in Altertum und Gegenwart. Von Arthur Schneider. *With Plate.*

A comparison of the areas occupied by the cities of Babylon, Carthage, Syracuse, Alexandria, Rome, Ephesus, Athens, Thebes, Tarentum, Sparta, Tyre, and Jerusalem in ancient times, and of Berlin and Vienna in the seventeenth century and now.

BIOGRAPHY.

Berchert. *Deutsche Rundschau G.* 18 (1896): 183–186. **Miessler.**

Oskar Borchert. Von Adolf Miessler. *With Portrait.*

Cowan. *Deutsche Rundschau G.* 18 (1895): 85–87. **Miessler.**

M. D. Cowan. Von Adolf Miessler. *With Portrait.*

Biography of a Madagascar missionary.

Drake. *Deutsche Rundschau G.*, 18 (1896): 182–183. ———

Sir Francis Drake. *With Portrait.*

French Explorers. *Rev. Française* 20 (1895): 724–731. ———

Nos explorateurs Africains. Par A. M. *With Portraits.*

Contains notices and portraits of Paul Crampel, Albert Nebout, Jean Dybowski, Casimir Maistre, and L. Mizon.

Gill. *Scientific African* 1 (1896): 35–38. ———

David Gill. *With Portrait.*

Gruner. *Deutsche Rundschau G.* 18 (1895): 37–40. ———

Dr. Hans Gruner, der Leiter der deutschen Togo-hinterland-Expedition. *With Portrait.*

Lesseps. *B.S. normande G.* 17 (1895): 77–115. **Gravier.**

Ferdinand de Lesseps. Par Gabriel Gravier.

Lóczy. *Deutsche Rundschau G.* 18 (1895): 133–136. **Palóczy.**

Professor Ludwig v. Lóczy. Von Professor Leopold Palóczy. *With Portrait.*

Thomson. *Deutsche Rundschau G.* 18 (1895): 40–41. **Wolkenhauer**

Joseph Thomson. Von W. Wolkenhauer. *With Portrait.*

Willkomm. *Deutsche Rundschau G.* 18 (1895): 137–138 ———

Professor Dr. Moriz Willkomm. *With Portrait.*

GENERAL.

Art of Travel. *Nouv. Archives Miss. Sci.* **6** (1895): 1–301. **Filhol.**

Conseils aux voyageurs naturalistes. Par M. H. Filhol. (Publication consécutive aux leçons faites au Museum d'histoire naturelle en 1893.)

This will be referred to in the Monthly Record.

British Association Report.

Report of the Sixty-fifth Meeting of the British Association for the Advancement of Science, held at Ipswich in September, 1895. London: John Murray, 1895. Size 9 × 6, pp. cxii., 884, and 118. *Diagrams, etc. Presented by the Association.*

British Empire. *Nineteenth Century* (1896): 218–235. **Wilson.**

The Protection of our Commerce in War. By H. W. Wilson.

Classification of Geography. *G.Z.* **2** (1896): 35–45. **Neumann.**

Die methodischen Fragen in der Geographie. Von Professor Dr. L. Neumann.

Educational. **Lyde.**

Man on the Earth, a course in Geography. By Lionel W. Lyde. London: Blackie & Son, 1895. Size 7½ × 5, pp. 192. *Illustrations. Price* 2*s. Presented by the Publishers.*

A series of nine short chapters dealing with as many separate aspects of geography in a very popular and simple form. It should be useful in stimulating an interest in geography, but requires to be accompanied by systematic teaching. The illustrations are numerous and representative, though varying a good deal in accuracy.

Geographical Principles. *Ann. G.* **5** (1896): 129–142. **De la Blache.**

Le principe de la géographie générale. Par M. P. Vidal de la Blache.

The author traces the evolution of the conception that the Earth must be treated in Geography as a whole, of which all the parts are co-ordinated

Geographical Year-Book. **Wagner.**

Geographisches Jahrbuch. XVIII. Band, 1895. . . . herausgegeben von Hermann Wagner. Gotha: Justus Perthes, 1895. Size 6 × 9, pp. viii. and 486.

The new volume of this Year-Book deals in the usual thorough manner with six distinct departments of geography, each article the work of a competent specialist. The articles are as follows: Progress of Physics and Mechanics of the Earth, by Dr. H. Hergesell; Progress of the Physics of the Earth's Crust, by Dr. E. Rudolph; New Advances in the Geological Structure of the Earth's Surface (1892–94), by Dr. Franz Toula; the Progress of Oceanography (1893 and 1894), by Professor Krümmel; the Special Geography of extra-European Countries—Africa (1892–94), Australia, and Polynesia, by Professor Hahn; North America (1893 and 1894), by Dr. B. Weigand; Latin America (1892–93), by Dr. W. Sievers; Asia (excluding Russian possessions), by Dr. G. Wegener; Russian Asia, by Professor Anuchin; the History of Geography, by Professor Sophus Ruge; and the Progress of the Study of Geographical Names, by Professor J. J. Egli.

Geography. *Knowledge* **19** (1896): 1–4. **Mill.**

Geography as a Science in England. By Hugh Robert Mill, D.Sc. Also a separate copy. *Presented by the Author.*

Suggests a memoir to the Ordnance Survey.

Legend of Barsisi. **Goldziher and Landberg-Hallberger.**

Die Legende vom Mönch Barsisâ. Von Dr. Ign. Goldziher und Dr. C. Graf v. [illegible] Kirchhain N.-L., Max Schmersow vorm. Zahn & Baendel, [illegible] pp. 30.

Money. *J.R. Statistical S.* **58** (1895): 559–590. **Probyn.**

Gold and Silver and the Money of the World. By Lesley C. Probyn. With Discussion.

Contains tables of the gold and silver-using countries of the world.

Navigation. **Colomb.**

[Course of Papers (No. 40).] Shipmasters' Society, London. Seventh Session Introductory Address, by Captain E. Blackmore. The Manœuvring Powers of Steamships and the Avoidance of Collisions. By Vice-Admiral P. H. Colomb. London: Pewtress & Co., 1895. Size 8½ 5½, pp. 56. *Diagrams.*

Sixth International Geographical Congress. **Giglioli.**

Prof. E. H. Giglioli. II VI. Congresso Geografico Internazionale Lettera al march. Giacomo Doria, Presidente della Società Geografica italiana. Rome, 1895. Size 9 × 6, pp. 16. *Presented by the Author.*

Sixth International Geographical Congress. **Ricchieri.**

VI. Congresso Geografico Internazionale di Londra. [Prof. conte G. Ricchieri.] Estratto dal Bollettino della Società Geografica Italiana, Fasc. IX. 1895. Size 9 × 6, pp. 10.

Sugar-Producing Colonies. *J. R. Colonial I.* 27 (1896): 77–109. **Williams.**

The Future of our Sugar-producing Colonies. By Mr. Justice Condé Williams.

NEW MAPS.

By J. Coles, *Map Curator*, R.G.S.

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England and Wales. **Ordnance Survey.**

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England and Wales. **Longmans.**

Relief Map of England and Wales. Longmans & Co., London and New York. Mounted on rollers. *Price* 4*s.* 6*d.* *Presented by the Publishers.*

ASIA.

Armenia. **Supan.**

Verteilung der Armenischen Bevölkerung in Türkisch-Armenien, Kurdistan u. Transkaukasien. Nach Cuinet, Selenoy und v. Seydlitz entworfen von A. Supan. Scale 1 : 3,700,000 or 58·4 stat miles to an inch. Petermann's 'Geographische Mitteilungen,' Jahrgang 1896, Tafel 1 Gotha : Justus Perthes. *Presented by the Publisher.*

Armenia. **Johnston.**

Map to illustrate the Armenian Question in Asia Minor. Scale 1 : 6,652,000 or 105 stat. miles to an inch. W. & A. K. Johnston, Edinburgh and London, 1895. *Price* 1*s.* *Presented by the Publishers.*

AFRICA.

Central and South Africa. **Bartholomew.**

Bartholomew's New Map of Central and South Africa. Scale 1 : 5,600,000 or 88·3 stat. miles to an inch. Edinburgh : J. Bartholomew & Co. *Price* 3*s. mounted.* *Presented by the Publishers.*

In the compilation of this map the most recent material has been used to bring it up to date

Congo. **Wauters.**

Carte des 200 premiers Kilomètres du Chemin de fer du Congo à l'échelle du 1 : 100,000 or 1·5 stat. mile to an inch. Dressée par A. J. Wauters, Secrétaire général de la Compagnie du Chemin de fer du Congo. Bruxelles : Administration du Mouvement Géographique, 1895

Transvaal. **Johnston.**

Map of the Transvaal or South African Republic and Surrounding Countries. Scale 1 : 3,801,600 or 60 stat. miles to an inch. W. & A. K Johnston, London and Edinburgh, 1896. *Price* 1*s.* *Presented by the Publishers.*

AMERICA.

British Columbia. **Martin.**

Map of the Province of British Columbia. Compiled by direction of the Hon. G. B. Martin, Chief Commissioner of Lands and Works. Victoria, B.C., 1895. Scale 1 : 1,124,200 or 18 stat. miles to an inch Sabiston Lithographing and Publishing Co., Montreal. 2 sheets.

British Columbia. **Boaz.**

Sprachenkarte von Britisch-Columbien. Von Franz Boaz. Scale 1 : 7,500,000 or 118·3 stat. miles to an inch. Petermann's 'Geographische Mitteilungen,' Jahrgang 1896, Tafel 2. Gotha : Justus Perthes *Presented by the Publisher.*

Venezuela—British Guiana Boundary. **Stanford.**

Stanford's Map of Guiana and Venezuela, showing the Territorial Claims of Britain and Venezuela, France, and Brazil. Scale 1 : 5,274,720 or 83·25 stat. miles to an inch. London : E. Stanford.

Venezuela—Guiana Boundary. **Philip.**

Special Map of British Guiana illustrating the Venezuela-Guiana Boundary Dispute, 1895-6. Scale 1 : 2,217,600 or 35 stat. miles to an inch. G. Philip & Son, London. *Price* 1*s.* *Presented by the Publishers.*

GENERAL.

Exploration. **Schrader.**

l'Année Cartographique. Supplément Annual à toutes les publications de Géographie et de Cartographie. Dressé et rédigé sous la direction de F. Schrader, directeur des travaux cartographiques de la librairie Hachette et Cie. Cinquième Supplement, contenant les modifications géographiques et politiques de l'Année, 1894. Trois feuilles de Cartes avec texte explicatif au dos. Paris : Librairie Hachette et Cie. *Price* 3 *fr.*

The first sheet contains a map of Central Asia, on which the route of Mr. Dutreuil de Rhins and Mr. F. Grenard (1891–94) is laid down; it also contains maps showing the Anglo-Chinese boundary between Burma and Yunnan, the route of Lieut. Debary from Tourane to Muong-Cao, the route surveys of Lieuts. von Prittwitz, Gaffron, and von Flottwell (1893) in Asia Minor, and Mr. H. Lake's work in Malacca, 1893. The second sheet contains maps illustrating the principal recent explorations in Africa, including Graf von Götzen's remarkable journey (1894). The third sheet contains maps of different parts of South America, in which explorations have been recently made. The maps are accompanied by explanatory notes, which are printed on the back of each map

Globes. **Philip**

Eight small Globes exhibiting the world in accordance with the ideas of Eratosthenes, 220 B.C.; Ptolemy, 150 A.D.; Behaim, 1492: Ruysch, 1508; Leonardo da Vinci, 1515; Schöner, 1515; Oronce Finé, 1531: and Mercator, 1569. G. Philip & Son, London.

This set of globes, which was exhibited at the meeting of the International Geographical Congress held in London last year, has been added to the collection, and can now be seen in the Society's Map-room. The conceptions of ancient geographers have been drawn on globes, which show, in faint outline, the correct delineation of the geographical features, and thus enable a comparison to be readily made.

The World. **Schrader.**

Atlas Universel de Géographie construit d'après les sources originales et les documents les plus récents cartes, voyages, mémoires, travaux géodésiques, etc.; avec un Texte analytique. Ouvrage commencé par M. Vivien de Saint-Martin et continué par Fr. Schrader. No. 77. Amérique du Sud en 5 feuilles. Feuille Nord-Ouest. Paris: Librairie Hachette et Cie.

This sheet, which forms part of a large map of South America, contains the whole of Columbia and Ecuador, the greater part of Venezuela, and part of the Brazilian province of Amazonas. The authorities used in the compilation of this map are named in the accompanying letterpress.

Like all the maps in this atlas, the style in which it is produced leaves nothing to be desired; but the number of years which has elapsed since their publication commenced is much to be regretted.

CHARTS.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, during November and December, 1895. *Presented by the Hydrographic Department, Admiralty.*

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2687		Little Bras d'or lake, and St. Anne and Sydney harbours:—Plan added, Baddeck harbour
1109		Harbours and anchorages in the Red sea:—Plan added, Melita bay.

(*J. D. Potter, Agent.*)

Charts Cancelled.

No.	Cancelled by	No.
2091 Monte Video bay.	New Chart. Monte Video bay. Approach to Cibil dock	2091
1927 Plan of Corinto harbour on this sheet.	New Chart. Corinto harbour (port Realejo)	660
708 Minow islands with Diabay. 698 Boyanna bay.	New Chart. Anchorages on the west coast of Madagascar:—Minow islands, Diamond bay, Boyanna bay	708
699 Makambytra.	New Chart. Maromanjo point to Makambytra bay, including Bombetoke bay	378
710 Coromandel coast. Sheet 3. From lat. 13° to lat. 15° (plan, Madras roadstead).	New Chart. Madras to Ramiapatam (plans, Madras roadstead)	575
302 Couteau bay to Cape Anguille.		

Charts that have received Important Corrections.

No. 2598, Curves of Equal Magnetic Variation. 240, England, south coast:—Hamoaze. 1451, Scotland, east coast:—Firth of Inverness and Beauly basin. 1479, Norway, west coast.—The Naze to the North Cape 2298, Gulf of Bothnia:—Sheet 3, Nystad light to Stor fiörd. 2252, Baltic sea:—Gulf of Bothnia. 2664, France, west coast:—D'Arcachon point to De la Coubre point, including river Gironde to Bordeaux 438, France, north coast:—Cape d'Alprech to Ambleteuse, including Boulogne 524, Mediterranean:—Gibraltar new mole. 1651, Nova Scotia:—Prince Edward island and part of New Brunswick. 2666, North America, east coast—St. John's to Halifax. 2670, North America, east coast:—Halifax to the Delaware. 478, Puerto Rico.—Port San Juan. Port Arecibo. 146, Africa, west coast:—Niger river (Nun entrance), Brass river. 653, Africa, east coast:—Ports of Conducia, Mozambique, and Mocambo. 663, Africa, east coast:—Mansa and Tanga bays. 253A, Gulf of Aden:—Jebel Jan to Seyára 164, Red sea:—Massawa channel, Port Smyth. 942B, Eastern Archipelago, eastern portion. 962, Ports in the Philippine islands 1601, China, east coast:—Wusung river or Hwangpu, Wusung river entrance. 140, Japan:—West coast of Kiusiu, from Mats'sima to Atsusi No-O-Sima, including Hirado island and Goto islands. 135, Japan:—Sagitsu-no-ura, Tomari Ura, Kata Ura. 2432, Russian Tartary:—Lamen Ula to Strelok bay, including Peter the Great bay. 1418, Australia, south coast:—Princess Royal harbour. 1674, Australia, east coast:—Brisbane river. 447, Australia, north coast:—Western approaches to Torres strait. 939, New Guinea:—Cape Nelson to Hercules bay. 214, Pacific ocean:—Solomon islands (plans, Gazelle harbour and Gizo anchorage). 440, South Pacific:—Fiji islands; Eastern archipelago, northern portion. 1490, North Pacific ocean:—Harbours and anchorages in the Sandwich islands.

(*J. D. Potter, Agent.*)

PHOTOGRAPHS.

Asia Minor. **Munro, Anderson, and Anthony.**

Twenty-five Photographs of North-West Asia Minor, by Messrs. Munro, Anderson, and Anthony, 1894. *Presented by J. A. R. Munro, Esq.*

The photographs show the characteristic scenery of North-West Asia Minor, the dwellings of the people, and some of the antiquities. They form a valuable addition to the Society's collection.

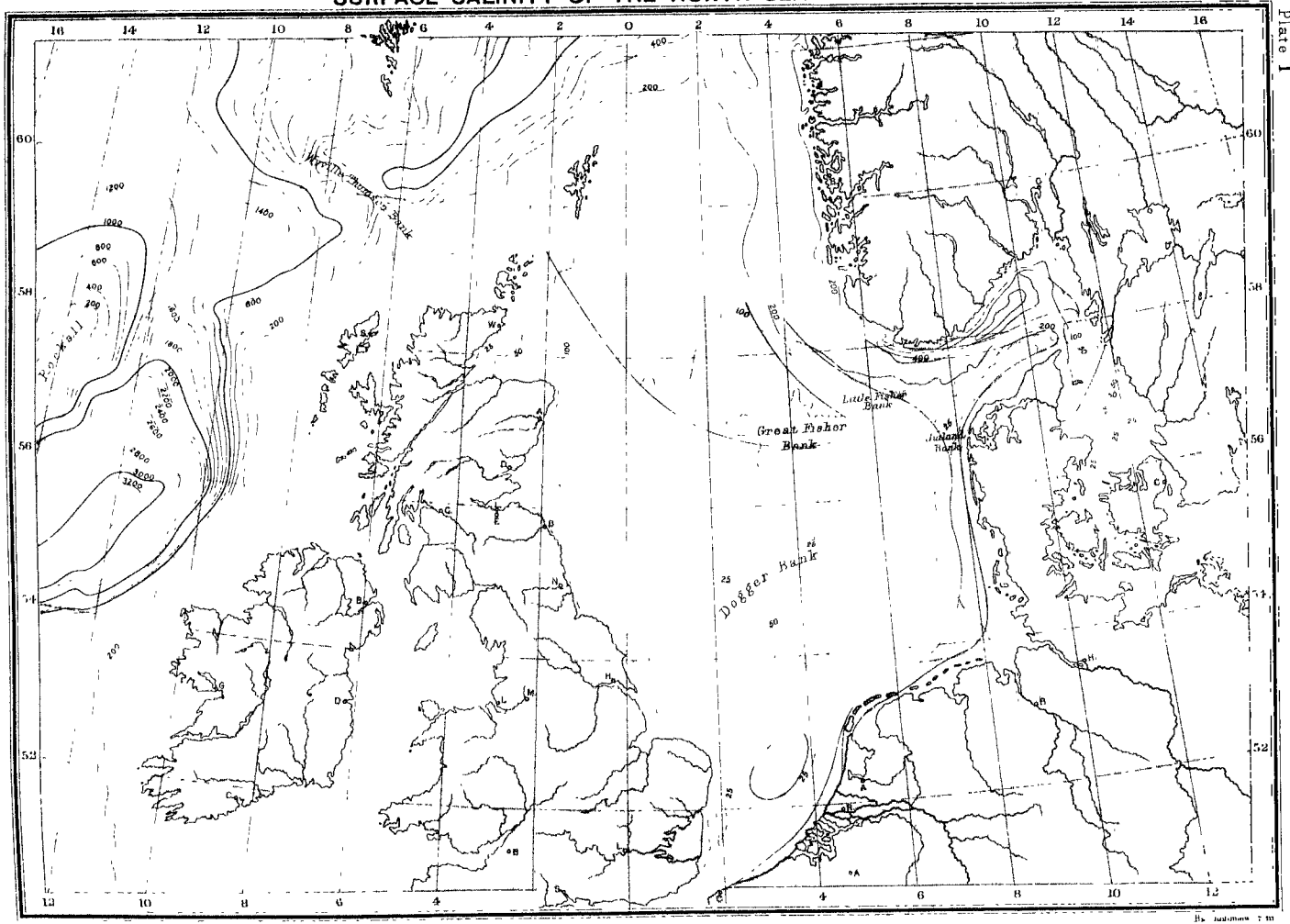
Norway. **Mockler-Ferryman.**

Seventeen Photographs of Norway, taken by Captain A. F. Mockler-Ferryman, in the autumn of 1895. *Presented by Captain A. F. Mockler-Ferryman.*

This series of photographs contains views of Norway taken in the Hardanger district, Telmarken, the Randsfjord river and lake, Laerdal, and a panorama of Vos-evagen. The views are well chosen, and the photographs are remarkably good.

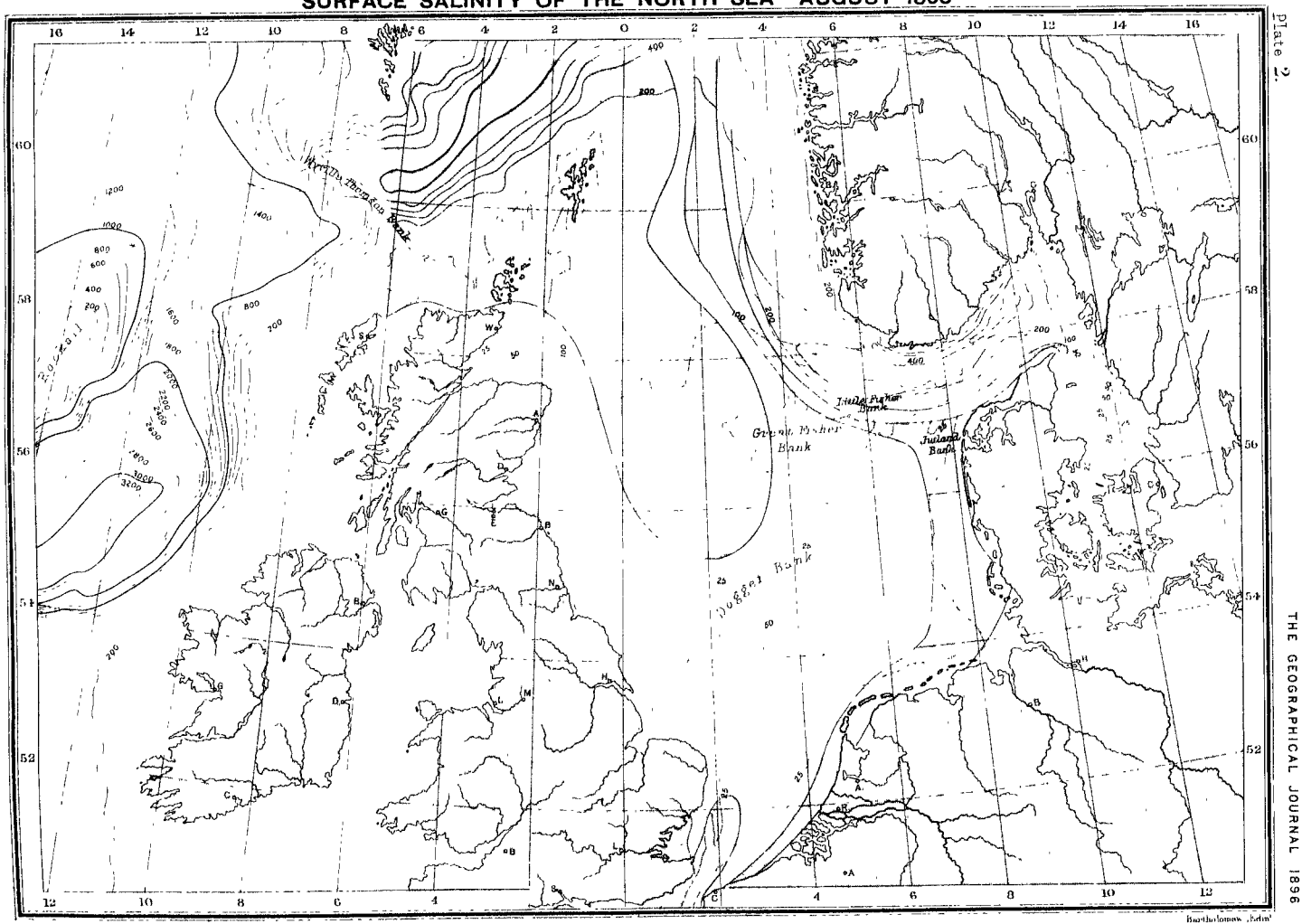
N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

SURFACE SALINITY OF THE NORTH SEA MAY 1893



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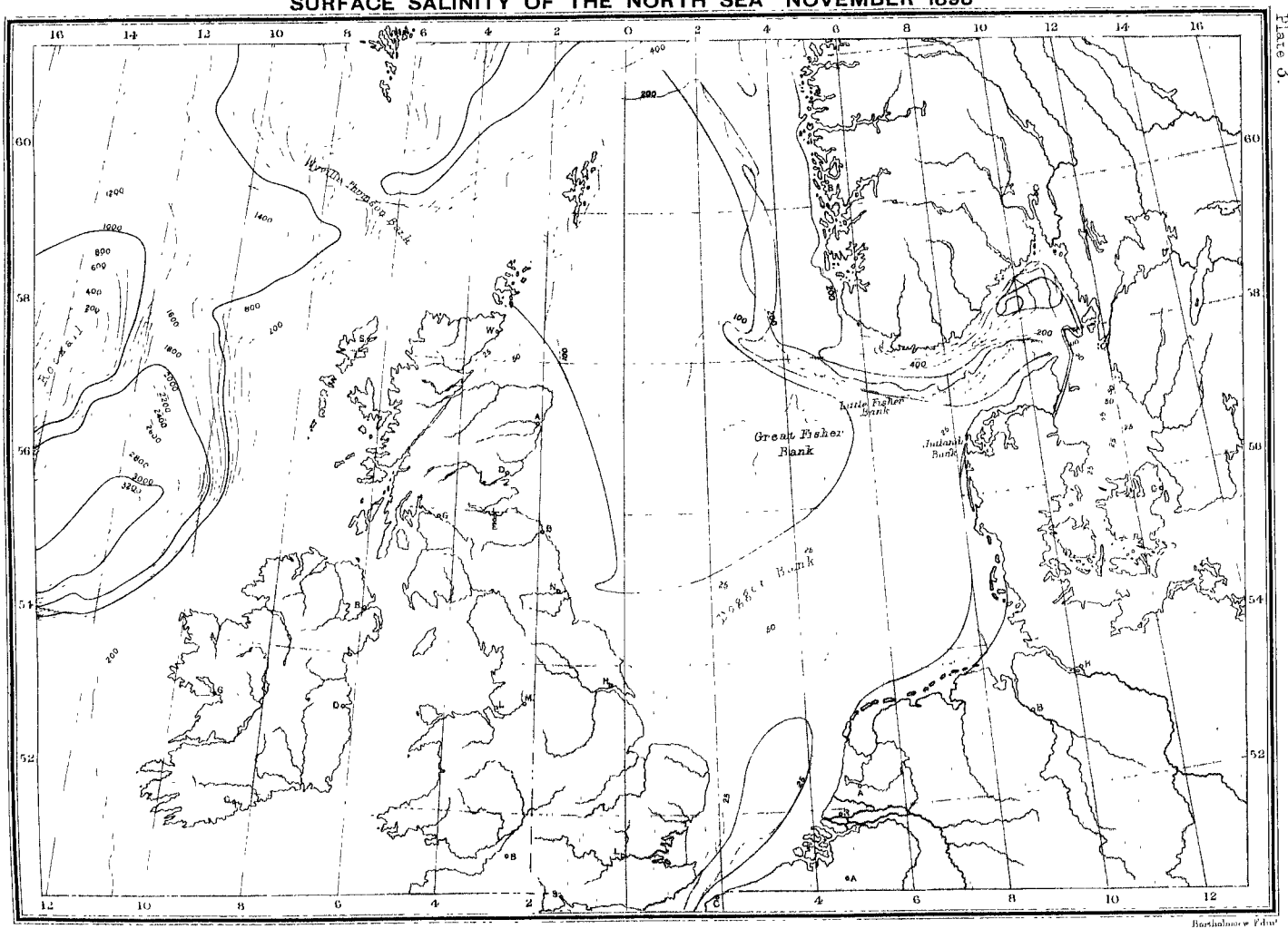
SURFACE SALINITY OF THE NORTH SEA AUGUST 1893



Bartholomew, Edin.

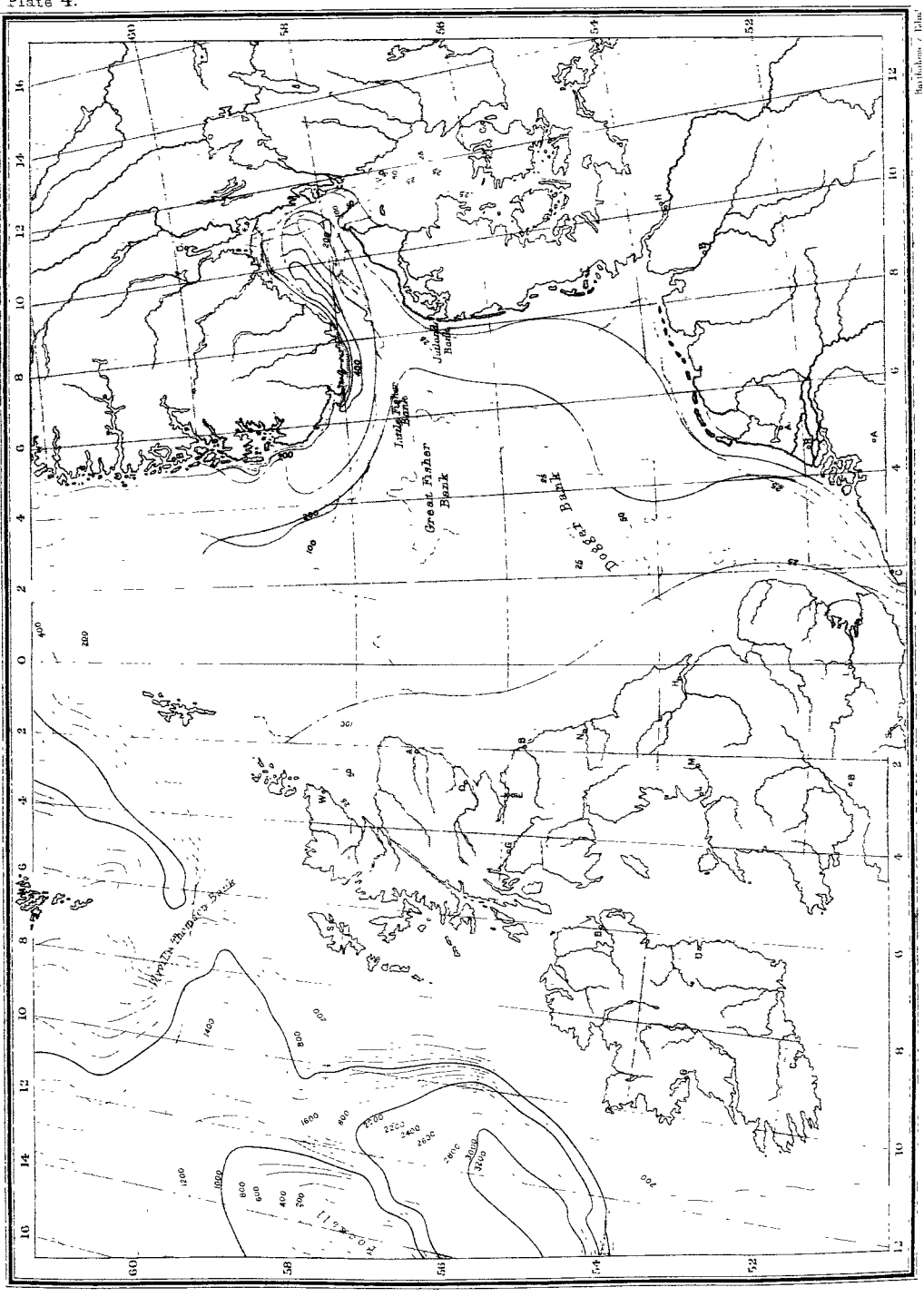
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SURFACE SALINITY OF THE NORTH SEA NOVEMBER 1893



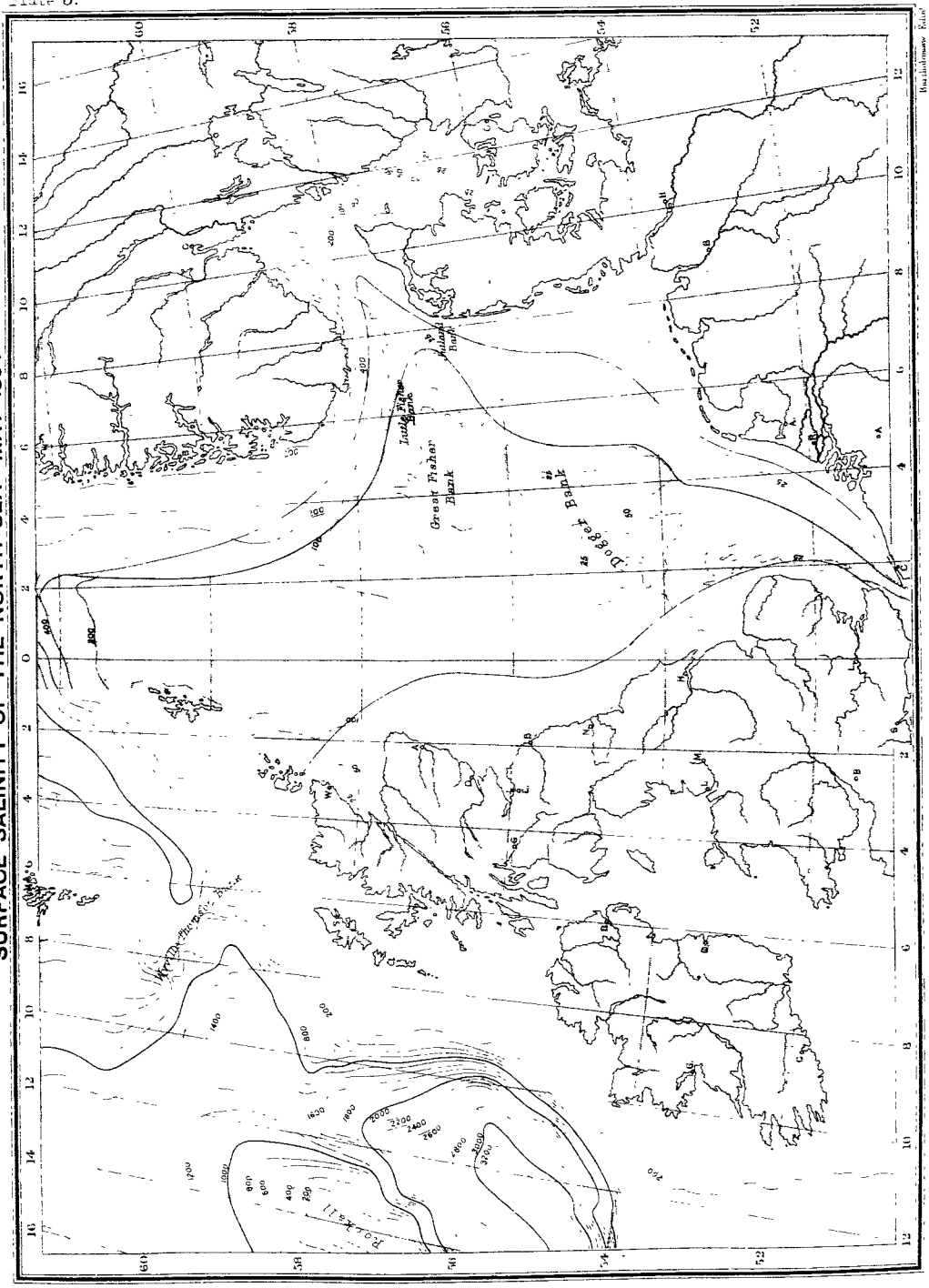
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SURFACE SALINITY OF THE NORTH SEA FEBRUARY 1894

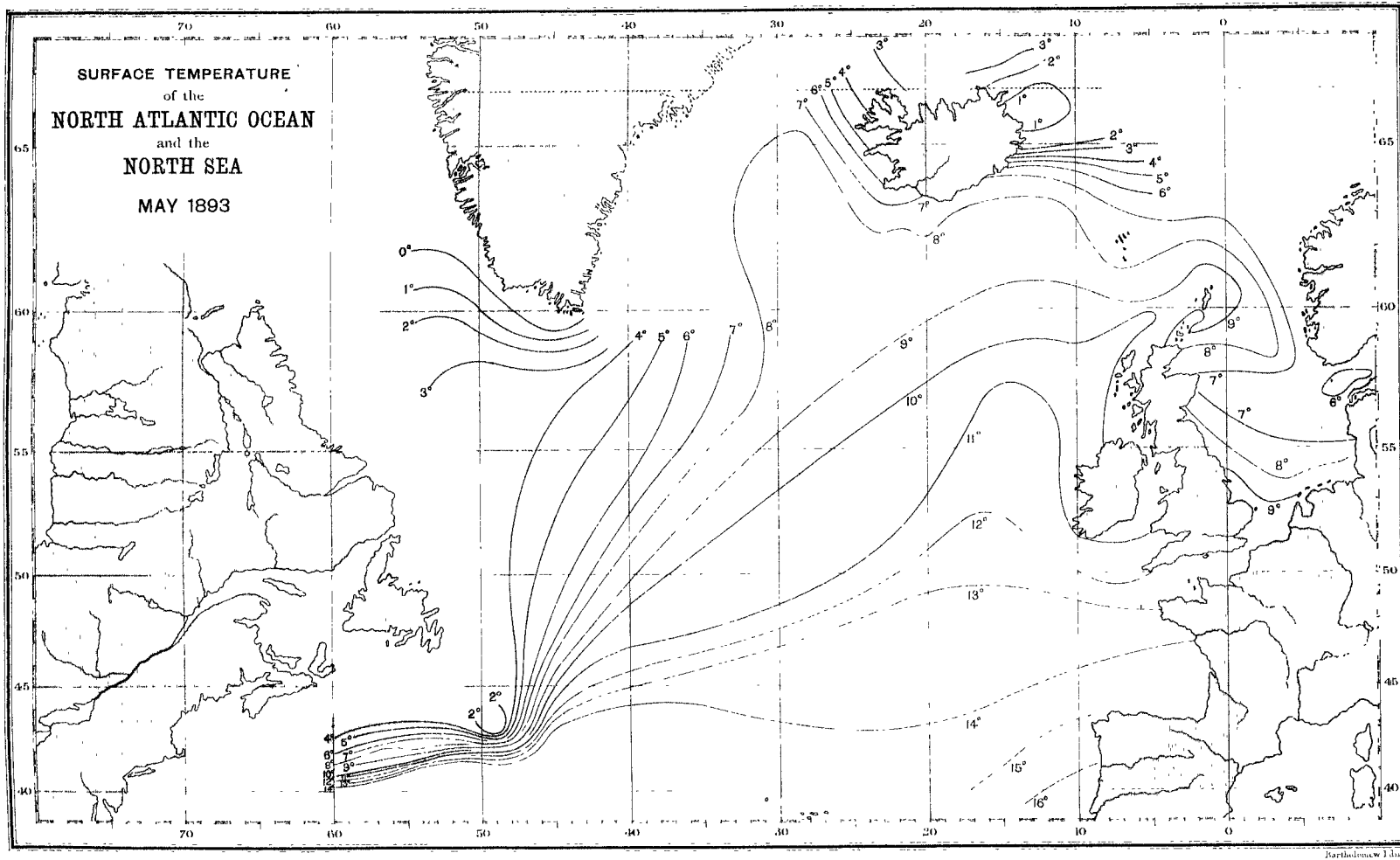


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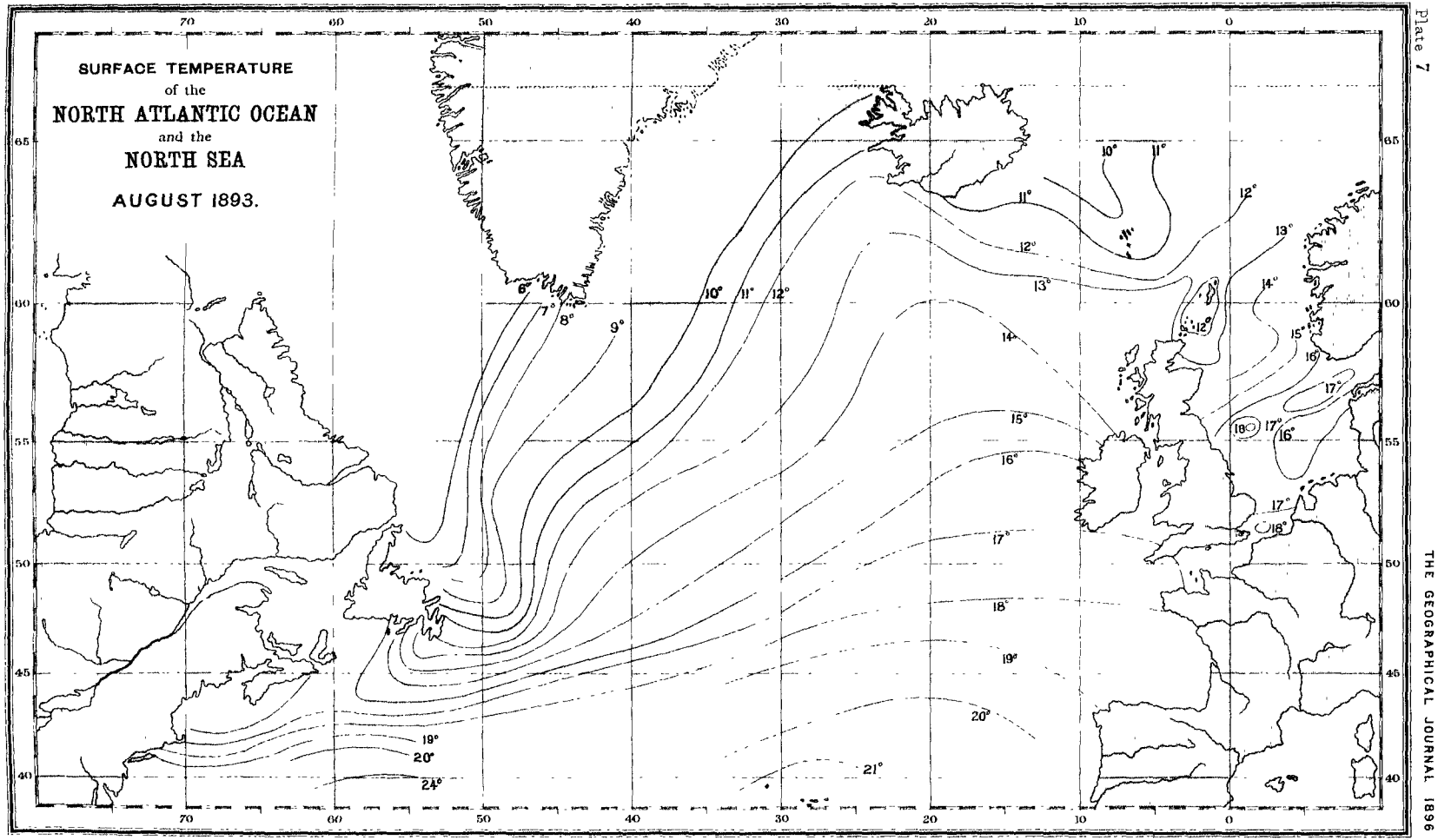
SURFACE SALINITY OF THE NORTH SEA MAY 1894



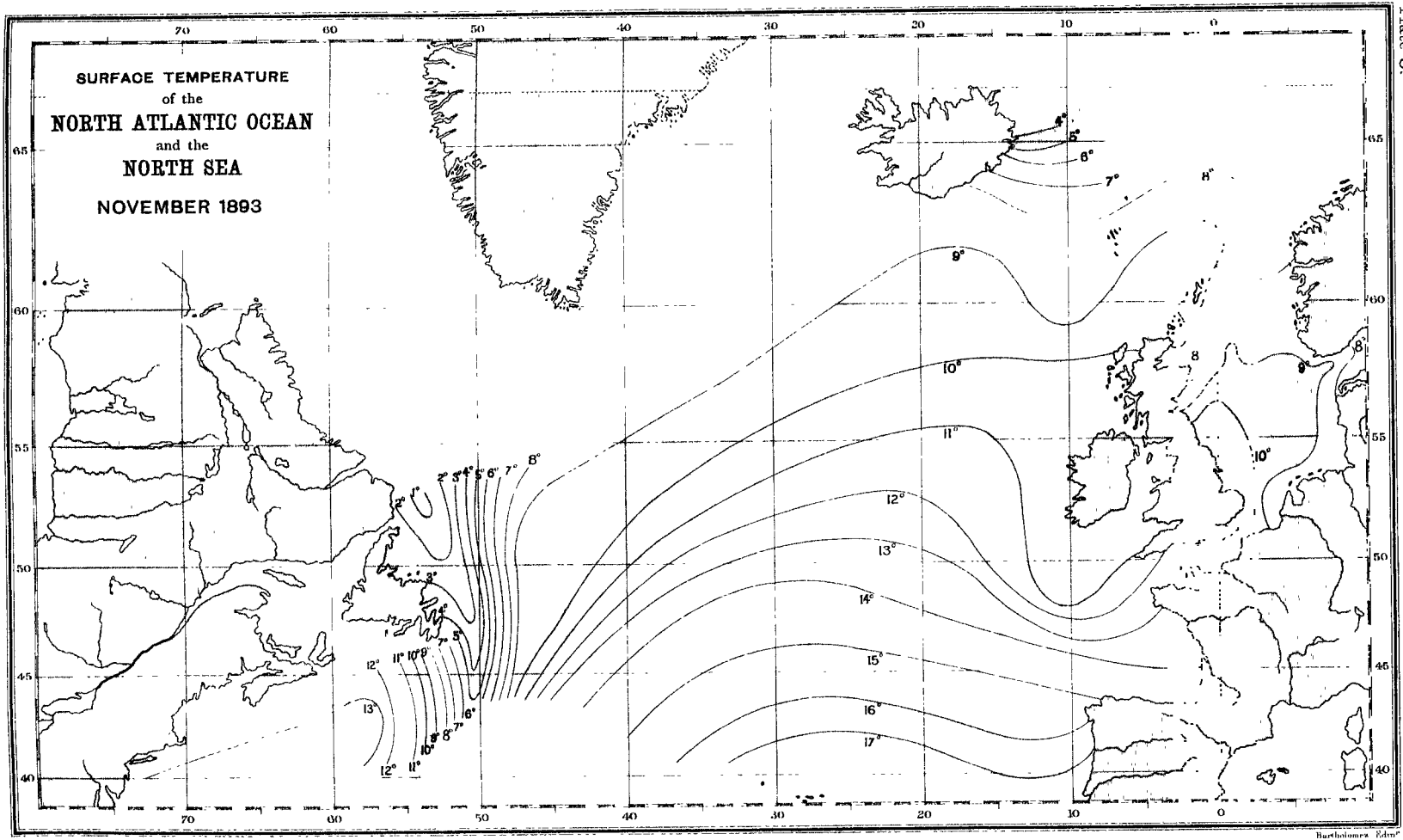
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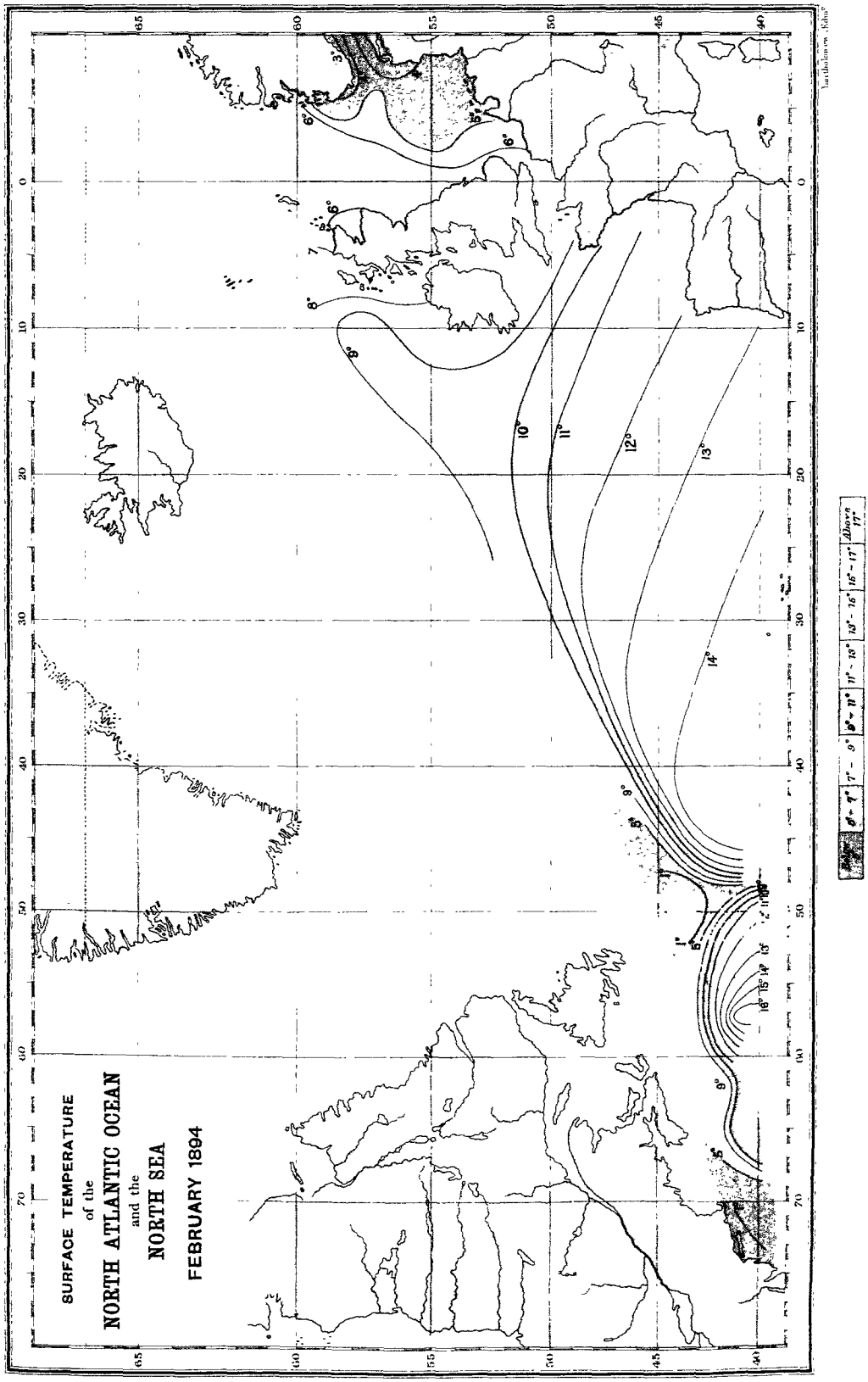


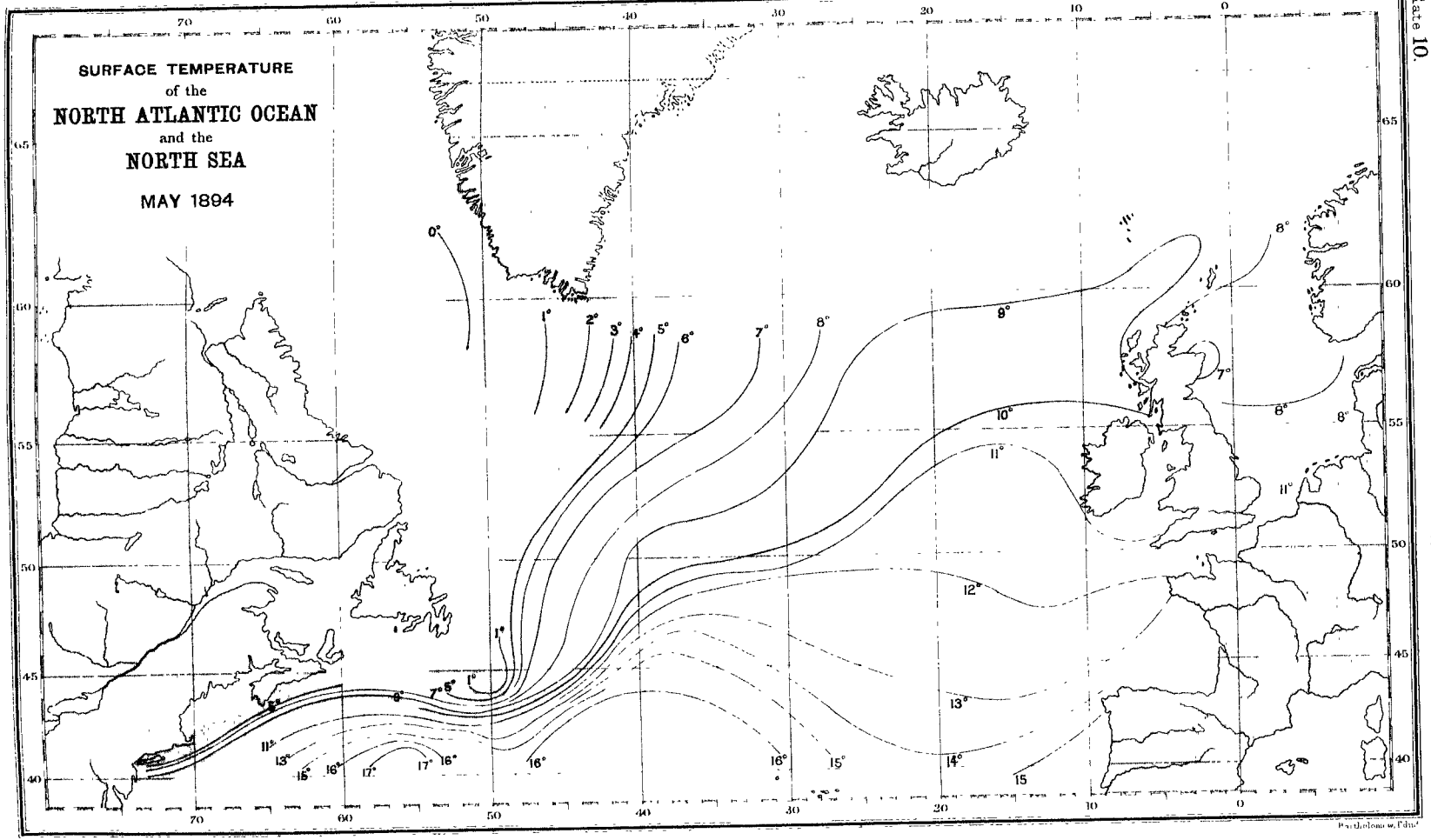
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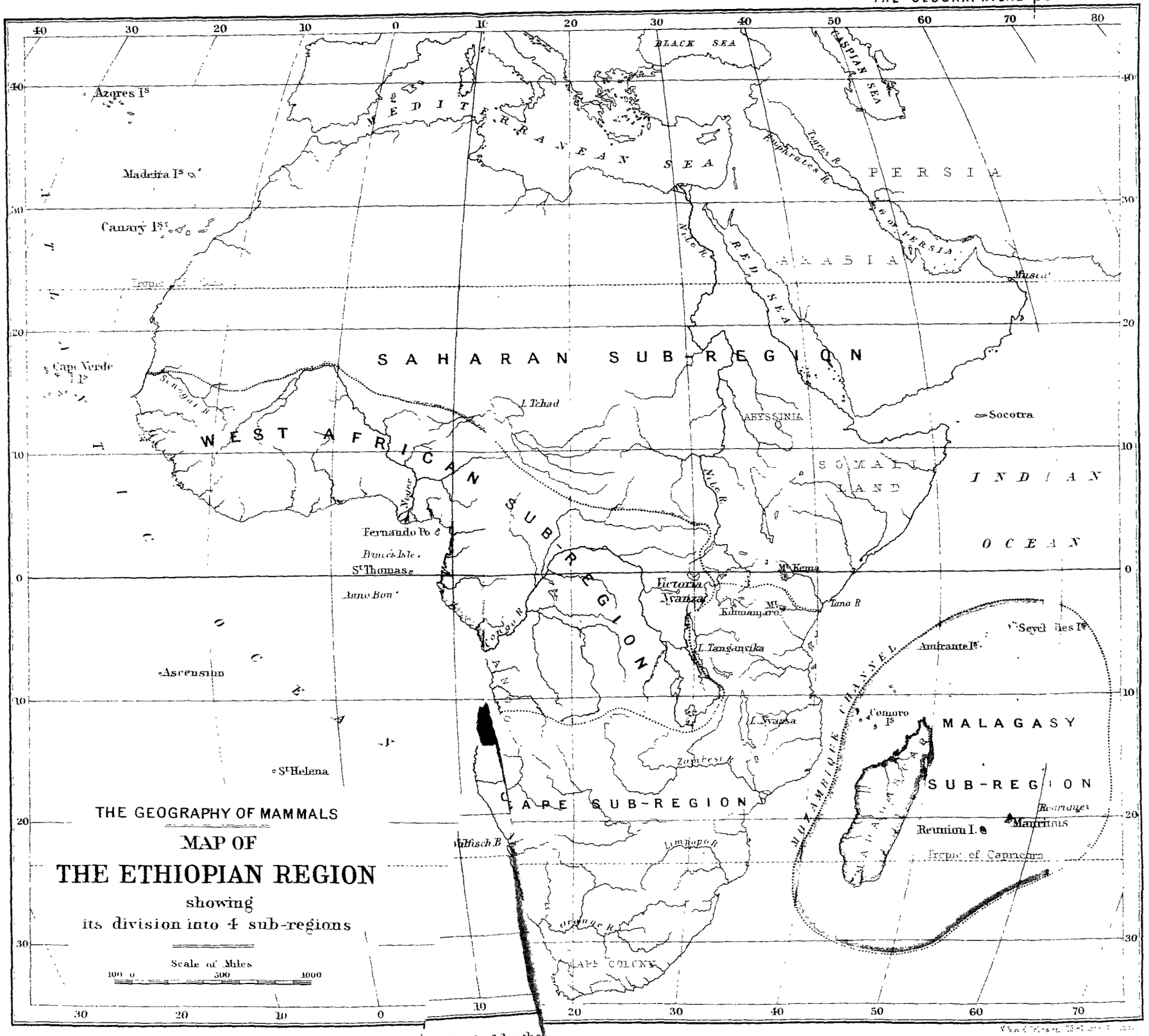
Below 5°	5° - 7°	7° - 9°	9° - 11°	11° - 13°	13° - 15°	15° - 17°	Above 17°

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SURFACE TEMPERATURE
of the
NORTH ATLANTIC OCEAN
and the
NORTH SEA
FEBRUARY 1894
Bartholomew, Edin.r
3°
4°
5°
6°
7°
8°
9°
10°
11°
12°
13°
14°
15°
16°
17°
Above 17°



Published by the Royal Geographical Society



THE GEOGRAPHY OF MAMMALS

MAP OF

THE ETHIOPIAN REGION

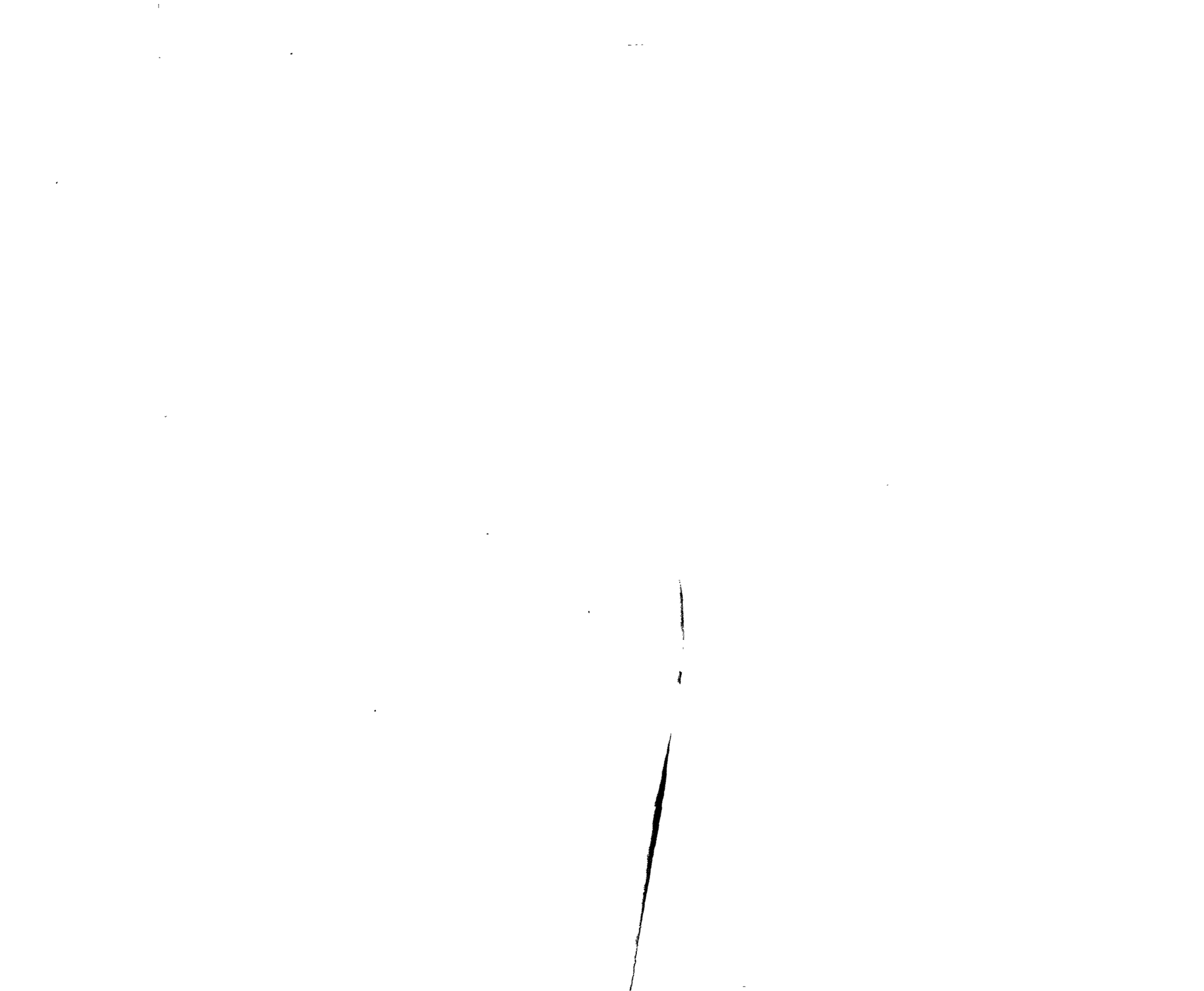
showing

its division into 4 sub-regions

Scale of Miles

100 0 300 1000

Published by the Royal Geographical Society



The
Geographical Journal.

No. 4. APRIL, 1896. Vol. VII.

PROPOSED GEOGRAPHICAL DESCRIPTION OF THE BRITISH ISLANDS BASED ON THE ORDNANCE SURVEY.*

By HUGH ROBERT MILL, D.Sc., F.R.S.E.

Geography, in its etymological sense, the description of the Earth, only begins where exploration ends. Thus, although exploration is necessarily the chief work of geographers at the outset, the exhaustion of unknown territory, remote as that achievement may be, will not require geographical societies to close their doors and declare their work accomplished. The facts as to the Earth's surface cannot be described before they are discovered; and they cannot be described fully until they have been studied, compared, and grouped in the way best adapted to bring out their mutual relationships. There is, I believe, practical unanimity amongst geographers of the present day in viewing geography as a science of definite individuality, though of wide generalization, dealing with the material collected by all specialists who explore or investigate the distribution of phenomena on the surface of the Earth.

This I expressed as follows in an article on "Geography as a Science in England," which appeared in *Knowledge* for January, 1896:—

"Geography as a science is not respected because it is not understood; and the ground of the misunderstanding, in some cases at least, is that 'a science' is not uncommonly looked upon as a department of specialized knowledge. Starting with this idea, it is perfectly logical for an objector to say that the ground claimed for geography is covered by the sciences of astronomy, geodesy, geology, oceanography, meteorology, botany, zoology, history, and anthropology—if, as is not likely, he allows that the last-named are sciences—and to declare that there is no room for the 'science of geography.' I contend that the departments of natural knowledge cannot be so 'clean cut from out and off the illimitable'

* Paper read at the Royal Geographical Society, March 6, 1896.

as to admit of their being arranged side by side to cover the field of nature like a tesselated pavement. Each one is, to a greater or less extent, permeated by those surrounding, and permeates them in turn: the astronomer is not independent of the chemist, nor the meteorologist of the astronomer. If sciences are to be viewed as *tessellæ*, the 'sciences' as at present familiarly classified must be analyzed into units of profound specialism, each of which may be a single and independent study, and may be utilized, differently combined, in neighbouring 'sciences.'

"We may, then, view 'a science' as composed of a group of specializations, a molecule compounded of atoms, so that the same atoms of ultimate specialization may be combined successively in different molecular generalizations. Another step carries us to the recognition of sciences of higher generalization, in which the units are the 'molecular' sciences themselves, combined and subordinated to a new yet special purpose. It is easy enough to recognize physics as capable of analysis into mathematics and the sciences of matter and energy—heat, light, electricity, and so on; yet he would be accounted a student of little perception who should deny the claim of physics to be a science because the ground is already covered with heat, light, and the rest. It is only in unfamiliar paths that scientific men 'cannot see the wood for trees.'

"My claim is that geography as a science is so far akin to physics that it is a generalization of the second order, a natural grouping of compound units which are individually distinct. The physicist looks on nature in the universal aspects of matter and energy; the geographer looks on nature in the limited, but still general, aspect of the surface of the Earth.

"Geography as a science is the exact and organized knowledge of the distribution of phenomena on the surface of the Earth. This involves the human race; and because the human race represents the culmination of organic evolution, the true understanding of the interaction of man with his terrestrial environment is the final object of geography. The materials for building up the final generalizing science fit to fulfil such an aim are yet far from complete; but they are already outlined with sufficient clearness to allow of progress being made in the general study. Incompleteness of data is the best incentive to progress and the surest guarantee of substantial advance. . . .

"I have already on several occasions endeavoured to give expression to my views of the content of geography as a science,* and need only quote here the opinion that the ultimate aim of geography is 'the elucidation of the Earth viewed as the present expression of a

* See 'The Realm of Nature' (London: John Murray); also "The Principles of Geography," in the *Scottish Geographical Magazine* for February, 1892; and "The Geographical Work of the Future," in the same journal for February, 1895.

definite evolution, in which every part is subordinated to the production of a suitable home and sphere of influence for civilized man.' The way to attain this end is obviously to proceed toward the completion of our knowledge of all the phenomena the interaction of which is in question, aided by such principles and relationships as can be deduced from what is already known.

"The astronomer, geologist, oceanographer, meteorologist, botanist, zoologist, anthropologist, and historian are all laid under contribution in different and varying degree to supply the building material for the geographer to combine, according to his special view-point, into a generalized science, capable of endless application to the sciences which helped to form it, and to the affairs of daily life. A large part may be taken in advancing a science without the individual specialists realizing the full import of their contributions, and comparatively few great travellers and explorers have been consciously geographers. In considering the position of scientific geography, it is desirable to distinguish between detailed exploration and research recorded for convenience by various adaptations of cartographic art, and the discussion and co-ordination of the relations which exist amongst the various special elements; to distinguish, in fact, between the collection and the interpretation of facts."

The attention of geographers has hitherto been directed mainly towards the collection of facts; we now require to discuss and arrange them. More facts and more surveys are, of course, required to perfect our knowledge; but for many parts of the world the main outlines are ready for discussion. The principles of geography serve as a trustworthy guide for describing a district which has been fully explored, and of which exact hypsometrical, geological, and other maps, have been prepared. The introductory plates in Mr. Bartholomew's new *Atlas of Scotland* contain a striking set of maps, on which a complete geographical description of that country might be based; but as the scale of the maps is small, the corresponding description would require to be general rather than detailed. The maps in question show the general configuration, the river-basins, the distribution of vegetation or agriculture, the distribution of population as to density and as to language, the rainfall and the temperature for each month of the year, the geological structure, the distribution of indigenous animals, the limits of deer-forests and fishery districts, and, finally, the counties. A geographical description of these maps as a whole would set forth the fundamental condition of vertical relief as influenced by geological structure on the one side, and as influencing climate, soil, vegetation, and the human inhabitants on the other, explaining how the people are related to the land.

With regard to the British Islands as a whole, the only maps in existence on an adequate scale are those of the Ordnance, Geological,

and (for the coasts) Hydrographic surveys. It is probably too much to hope that these will soon be supplemented by agronomic maps such as are now being prepared in France, and also, I understand, in some parts of Germany; and it is, unfortunately, scarcely possible that the other conditions dealt with by Mr. Bartholomew will ever be fully mapped for the country as a whole.

The question of a geographical description of the British Islands has been before my mind for several years, and many ideas have suggested themselves as to the form such a work should take. There are a few fragments sufficiently large and sufficiently good to make a geographer regret that they are of restricted scope, and written usually from an aspect that is incompletely geographical. Sir A. Geikie's 'Scenery of Scotland,' Sir A. Ramsay's 'Physical Geology and Geography of the British Islands,' and Mr. Topley's 'Memoir on the Weald,' are a few out of many works which have been prepared from the geological point of view. There are many guide-books excellent for their purpose, the information in which, if rearranged in systematic form, would be geographically valuable; and there are a few good books on special districts, such as those prepared for British Association meetings, giving in some cases a really comprehensive account of the different natural conditions by independent specialists. As a rule, these works are not knit together by the unifying influence of geographical principles. In Germany the valuable monographs on (to select titles at random) the deciduous forests of Saxony, the distribution of German-speakers in the French part of Switzerland, the orography of the Eifel, the rainfall of Silesia, etc., which appear in the 'Forschungen zur Deutschen Lands- und Volkskunde,' are excellent examples of work individually good, but incapable of being combined, and never likely to cover the whole country with a uniform degree of elaboration. Regional geography has received a good deal of attention in other countries, and several districts have been made the objects of excellent memoirs, such as Auerbach's on the Lorraine Plateau. Something of a similar kind, specially adapted to our own country, and considering the whole of it in equal detail, is, I think, what is required. So many large schemes are spoilt by want of uniformity in their execution, or by incompleteness on account of attempting too much at the outset, that it is essential in any new plan to consider the possibilities of the work very carefully before commencing.

I propose, then, to discuss whether a complete geographical description of the British Islands could be prepared from existing data, or how far these should first be supplemented by new researches and by the collection of unpublished information. The work would have to be done on a uniform scale for every small selected unit of the country; then combined into a series of regional memoirs dealing with natural districts, such as the Weald, the Cornwall-Devon peninsula, Wales, the Lake District, the Pennine chain, East Yorkshire, the Scottish Southern

Uplands, Central Plain, Highlands, etc. Ultimately all these would require to be generalized into one great memoir on the whole country, the result of a series of generalizations carried out much in the same way as the various maps of the Ordnance Survey are obtained by successive generalizations from the largest scale produced. Counties or even parishes might be selected as units for description, but there are serious difficulties in doing so. The size of these divisions is so varied, and their outlines are so fantastic in detail, that a great deal of overlapping would be unavoidable; and, besides, for the physical description on which the whole must be based the county boundaries are quite unsuited. The 6-inch maps into which the counties are divided are on too large a scale to be taken as the basis of a general discussion, which must be kept within practicable limits. The 1-inch map might more appropriately be adopted as the basis of the description, which might, in the first place, be made a "Geographical Memoir to the Ordnance Survey Map on the scale of 1 inch to 1 mile." The map is, of course, divided up into sheets without regard to physical or political features; but the sheets have the advantage of being rectangular, of uniform size,* and of existing as actual units, each one of which may be separately purchased, and any of them readily found by reference to an index map which gives its number. A group of adjacent sheets might be treated together in a single memoir, if that method is found to be preferable.

The idea of a memoir to the Ordnance Survey is so essential to the completeness of the work, that it was naturally accepted long ago. The first volume of a memoir on Ireland was actually published in 1835, and a great amount of most interesting information collected, when, by one of the unfortunate changes of policy which have harassed the survey, the work was stopped. On the assumption that a new memoir might be prepared, I shall consider in order the chief sources of information, the plan of the memoir, the method of executing the work, and its probable magnitude, duration, and utility.

1. Chief Sources of Information.

(*a*) The basis of the description should be the topographical map of the Ordnance Survey on the scale of 1 : 63,360 or 1 inch to 1 mile. This, including the new survey of England, will be complete before the close of the present century. The sheets, measuring 18 inches by 12, contain 216 square miles of surface for England and Ireland; but the sheets for Scotland measure 24 inches by 18, and contain 432 square miles. The map is in two editions, showing relief by hachuring and contouring respectively, and all sheets are graduated on the edge to single minutes of latitude and longitude, with subdivisions to 10 seconds. In special

* The sheets of the map of Scotland are twice as large as those of England or Ireland.

cases the maps on the scale of 1 : 10,560 or 6 inches to 1 mile would be referred to.

(*b*) The maps of the Geological Survey on the same scales supply in many cases the geological reasons for geographical conditions, and the memoirs to the various sheets or on selected districts usually give valuable summaries of the physical geography from the geological standpoint.

(*c*) The charts of the Hydrographic Department supply full details as to sea-depths along the coast, and as to depths of navigable rivers and a few lakes.

(*d*) The publications of the Meteorological Office, of the two Meteorological Societies, and of Mr. Symons (for rainfall), contain a great amount of information as to the climate of the British Isles.

(*e*) The Census Reports give full particulars of the population of each registration district and of their occupations, a matter of great geographical importance, although I am not aware that the distributional relations of the Census have ever been fully worked out in the manner adopted, for example, by the United States Census Office.

(*f*) The Reports of Births, Marriages, and Deaths supplement the Census Returns in many ways, and contain materials for statistical maps, including maps of the distribution of diseases as worked out by Dr. Haviland for the Lake District.

(*g*) The Board of Trade and other Government departments publish full accounts of exports, imports, and of internal transport, of mineral and agricultural produce and manufactures, all of which are capable of geographical treatment.

(*h*) The publications of such societies as the Royal Agricultural, the Archæological, the Statistical, the Institution of Civil Engineers, and many others, contain papers on subjects which may be profitably consulted, and there are numerous county histories and books on special aspects of geography from which help may be obtained.

(*i*) There are now several amateur photographic societies which make systematic collections of characteristic pictures of their own neighbourhood, such as that over which Sir Benjamin Stone presides in Warwickshire. Numerous local scientific societies are rendered accessible and capable of acting in concert through a committee of the British Association, many of the members of which are willing to act as skilled collectors of information. I have, in a previous research, had occasion to ask the co-operation of these societies, with the happiest result.

2. Plan of the Memoir.

Taking the 1-inch map as a basis, the discussion and treatment would be on a corresponding scale. No doubt, by enlarging on each of the heads to be mentioned, a treatise of great length might easily be compiled for each sheet. My proposal is to aim at conciseness; as far as possible to touch only on essential matters, and to treat these

exclusively from the geographical standpoint. A good deal of repetition would be avoided by the preparation of an introductory memoir describing the general features of ordnance maps, explaining scales, the use of contour-lines, and map-reading generally. This should also contain a statement of the principles of geography as applied to regional descriptions. The suggested memoir for each sheet would include—

(*a*) *Index* of all names on the sheet, referring to them by latitude and longitude in areas of one minute by one minute, giving also the altitude (exact or approximate) in the case of hills, river sources, towns, villages, houses, etc., and the length of streams or portions of streams included.

(*b*) *Place-names.*—Notes on such of the place-names as present features of geographical interest.

(*c*) *Mean elevation* of the sheet, with the areas between successive contour-lines, and statement of maximum and minimum heights.

(*d*) *Hypsographical Description.*—A general statement of the elevations and depressions of the sheet, mentioning their relation to the larger features of the country. Length of streams and their drainage areas.

(*e*) *Physiographical Explanation* with reference to the type of land-form in relation to geological structure, the position of the surface in the cycle of geographical development, the character of the soils and mineral productions, the local magnetic conditions, and the conditions of climate, so far as these are dependent on position and configuration.

(*f*) *Vegetation and Agricultural.*—The approximate areas of woodland, moorland, pasture, arable land, and the leading crops. Local floras and faunas.

(*g*) *Political and Historical.*—The parish, county, and municipal boundaries. Historical sites, and events which depended on geographical conditions.

(*h*) *Geographical Description*, showing the relation of the human inhabitants to all the foregoing conditions, especially with regard to the sites of towns and villages, the distribution of population, the utilization of natural resources, and historical development of industries. Local vocabularies.

(*i*) *Illustrations.*—A few carefully selected photographs of typical scenery should accompany each sheet. Some sketch-maps and diagrams might also be included.

(*k*) *Bibliography*, giving titles of works relating to places contained in the sheet.

Several matters of very great importance cannot be included, because the facts to be ascertained would involve special surveys, *e.g.* the variation of the force of gravity; the seismic conditions; hydrographic conditions involving the volume, speed, and normal seasonal fluctuations of all rivers—a subject which will acquire great economic importance in a few years—and the ethnopological description of the people.

3. Method of Execution.

Assuming that a geographical description on the plan indicated were to be carried out under proper conditions, the various points mentioned might be worked up as follows:—

(*a*) *Index.*—This requires simple mechanical compilation. It would vary greatly in length, some sheets having less than 50 names, others probably more than 1000. (Official indexes to the maps of the United States Survey are published as part of the routine of that Survey Office.)

(*b*) *Place-names.*—The notes would be limited to (1) alternative names for places mentioned in the sheet, (2) corrections of spelling, (3) critical discussion of such place-names as are descriptive of geographical forms or positions, (4) discussion of names which can be traced by historical records sufficiently far back to throw light on prehistoric populations. The necessary information would be obtained from topographical and archæological works, from dictionaries of place-names, and from local students; but the lists would require very careful editing by an expert, and must be strictly limited to cases concerning which there is no reasonable doubt.

(*c*) *Mean Elevation.*—The area between successive contour-lines on the map must be measured by the planimeter or by squared tracing-paper, and the volume deduced by considering the mean inclination of the successive surfaces, which would also give the true area of the country as contrasted with the area projected on the plane of sea-level given on the map. The distortion due to the conical projection on which the map is drawn will probably be too insignificant to require notice; if not, it must be allowed for. Check estimates might be made by Heiderich's method of drawing numerous equidistant profiles, and calculating the contents by Simpson's formula; and also by marking as many actual elevations as possible on the map, and combining the arithmetical averages of each square inch, as in Karsten's method of estimating ocean depths. This work demands a considerable amount of skill and attention. It would be very suitable as an exercise and training for students, if any institution existed in this country where students could be induced to study geography seriously.

(*d*) *The Hypsographical Description* would in most cases be very brief. It should be written from the map, considering both hachures and contour-lines, and afterwards verified on the ground. The lengths of parts of rivers and their drainage areas would be treated in this description.

(*e*) *The Physiographical Explanation* would, so far as the geology is concerned, be simply a restatement of the "Physical Geography" section of the Geological Survey memoir, with such modifications as the modern views of the cycle of development of a land surface suggest. The character of the soils would, to a certain extent, be derived from the drift-maps of the Geological Survey, from notes of official or private geologists, and in some cases from local inquiries. The mineral

productions would be described from the official returns. Climatic data would be derived from the publications of the Meteorological Office and of societies, supplemented in many cases by local information.

(*f*) *Vegetation and Agriculture.*—The areas of forests, parks, and moorland or commons would be measured on the 6-inch Ordnance Survey maps, on which a distinction between different kinds of wood is made. The agricultural information would be got from official returns, the transactions of agricultural societies, and local inquiries; while a knowledge of any peculiarities of local flora and fauna would be similarly obtained.

(*g*) *Political and Historical.*—The boundaries would be taken as shown on the map, referring to any important changes, such as the Reports of Boundary Commissioners. Historical information would be sought from historical and archæological societies, and would be very stringently edited, so as to confine it strictly to those features and events of direct geographical importance.

(*h*) *The Geographical Description* would be the most important part of the memoir, and must be the work of a trained geographer, who, after studying the maps in the light of all the information referred to above, shall have made himself familiar with the ground. It would deal directly with the relation of the people to the land, showing the control exerted by geographical conditions on the sites of towns, on dwellings, occupations, the distribution of the people, the lines of communication, and, if data are forthcoming, on local character. Historical changes in the resources and industries of a region would be considered, to show in what degree they occurred in consequence of geographical changes, *e.g.* the silting up of harbours, the destruction of forests, the discovery or exhaustion of minerals; or in what degree they occurred in spite of geographical conditions, *e.g.* the establishment of a gunpowder factory in an agricultural district, or the tunnelling of a hill by a new railway. Many of the more interesting relations to be discussed in this description are undergoing change, and unless they are soon studied and recorded the value of the work will be much reduced.

(*i*) *Illustrations.*—A sketch-map on the scale of, say, 10 miles to the inch would be given, showing the area of nine sheets of the 1-inch map, including the eight sheets which touch the sheet under consideration. A small index map on the outside cover could show the sheets contained in the whole country (England, Scotland, or Ireland, as the case might be). One or two characteristic profiles on a natural scale might be given: and a selection of views of characteristic scenery taken from a carefully chosen standpoint. It might be found possible in a few cases to give characteristic type-portraits of the people, and illustrations of the leading industries of the district.

(*k*) *Bibliography.*—All the books, articles, or references dealing with places referred to in the sheet would be recorded, so that a student could at once refer to all available original sources.

4. PROBABLE MAGNITUDE, DURATION, AND UTILITY OF THE SUGGESTED WORK.

The land area of the British Islands, excluding the Channel Isles, is estimated at 120,904 square miles, which would correspond to 560 sheets containing 216 square miles each, the size of the English 1-inch sheets. On account of the irregularities of coast-line, the 1-inch map of England contains 360 sheets, that of Ireland 205 sheets, and that of Scotland 131 sheets of double size, corresponding to 262. The total number is thus equivalent to 827 sheets of the usual size (18 inches by 12), but of these 27 at least are, so far as one can judge from the index maps, entirely blank, leaving 800 which would have to be considered. Of the 800 there are at least 258 which contain less than half their area of land surface. However, it seems to me that the advantages of having the memoirs in the form of a pamphlet corresponding to each sheet, and numbered in the same way, would be sufficient to make it worth while to face the prospect of 800 separate booklets. There might, in fact, be rather more, as the special sheets combined out of several to show the environs of important towns would naturally be included. The little books would be partly statistical and partly descriptive, and their aim would be to present the information in the concisest and most systematic form. In many cases several headings would scarcely be mentioned, *e.g.* in a sheet of Irish bog or Scottish deer-forest, the description would of necessity be very brief; and in the case of sheet 354 of the English map, the index would contain only one name, "Eddystone Lighthouse." In this instance, of course, a memoir would not be proposed, and possibly wherever a sheet contained less than a certain area, say 50 square miles, of land, it would be found convenient to reckon it as part of its next neighbour. If the memoirs were printed in royal octavo form, uniform with the *Geographical Journal*, the size of each might vary from 8 to 32, or possibly in rare cases to 48 pages. This is little more than a guess, but it illustrates the scale on which I think the work should be undertaken. The average length might be about 24 pages, which would give 19,200 pages for the whole work. This would correspond to twenty volumes of 960 pages, that is, of the size of the last volumes of the new series of the *Proceedings* of the Royal Geographical Society. If the work were undertaken with a sufficient staff to turn out an average number of forty memoirs in a year, it would require twenty years for its completion; an increased staff would allow of the work being more quickly completed. These figures are certainly somewhat formidable, but measured by the duration of the Ordnance Survey itself they shrink into insignificance, and compared with other large pieces of scientific literature, such as the 'Encyclopædia Britannica,' the 'Challenger Reports,' or Reclus' 'Geographie Universelle,' the time of preparation is not disproportionately long.

The utility of such a memoir may be reasonably doubted by the general public, but it must be clear to the mind of every geographer; and before twenty years go by we hope to have the education of the

general public also advanced to the point of appreciation. I feel confident that a memoir to each map would greatly enhance the usefulness of the maps themselves, and would help to make them more readily understood by those who now use them, and by the far too large number of people who have never heard of their existence. But I would not lay any stress on the argument of immediate utility. In my opinion the important practical point is that, in the prospect of increasing agricultural depression, and in prevision of the certainty of the ultimate recovery in the value of land in the British Islands when the fields of America, Russia, and India cease to yield a paying return at low prices, it is absolutely essential to have a trustworthy account of the actual conditions and resources of our own country. The account would in some degree correspond to Sir John Sinclair's 'Statistical Account of Scotland' of a century ago; but would, of course, have the advantage of a more systematic plan and far more numerous and more exact data. It will not be so very many decades before waterfalls will rival coal-mines in industrial value, and the tidal bore in an estuary will determine a centre of dense population. The study of the country in the light of scientific geography will then be a vital necessity, and it is our duty as geographers to see that we hand on our science as an efficient implement for the needs of a later age. A century ago the science of chemistry was in a state only a little less developed than geography is now, and the predictions of a Cavendish or Lavoisier as to the future utility of his science probably excited as little attention as the remarkable paper of General Annenkoff on the "Importance of Geography in view of Agricultural Crises" at the International Geographical Congress did last year.

I have little doubt that in the coming century the generalizations of geography will find a multiplicity of applications in economic, political, and social life, which will be of the utmost national importance. Even now we recognize instances, economic, political, and social, where ignorance or neglect of geographical principles has led to results which may fairly be called national misfortunes. I feel sure that some such scheme as that set forth in this paper will provide in its elaboration the means for greatly advancing geography and perfecting its theory; and on its completion will form a mass of geographical information which will retain a permanent value.

When the work is proceeding, regional memoirs embodying the data, but improving on the form, of the unit-descriptions would be compiled; and when it is complete, but not before then, the first real geography of the British Isles will become possible.

So far, I confess that the scheme is only a seductive dream. As in so many other great works in all sciences, the practical problem of expense presents a deterrent aspect. I have merely sketched in rough outline certain ideas which have gradually taken form in my mind, and I hope

that we may hear the opinions of experts upon them. If the plan is considered impracticable or inexpedient, I shall willingly let it rest until a fitter time. But if it is generally thought that the plan is a sound one, or is capable of such amendment as to make it satisfactory, a farther step must be taken, to consider whether Government could be urged to do the work, or whether the resources of scientific societies or the generosity of the not-impossible patriotic millionaire ought to be appealed to. The actual organization of the staff for carrying out the work may be left out of sight for the moment, but it should present no difficulty; there are very few professional geographers trained in modern scientific methods in this country, but, few as they are, they are to-day actually in excess of the demand for their services.

Before the reading of the paper, the PRESIDENT said: Dr. Mill is going to make a proposal to us, which, in my opinion, is of very great, almost imperial importance. I think, when he has read it, every one present will be of the same opinion, and it will probably lead to an interesting discussion. I will therefore not make any preliminary remarks, but will call upon Dr. Mill to address us on the proposed geographical description of the British Islands, based on the Ordnance Survey.

After the reading of the paper, the following discussion took place:—

Sir CHARLES WILSON (late Director-General of the Ordnance Survey): I think we are all much indebted to Dr. Mill for his extremely interesting and suggestive paper. Something of this kind was intended when the 6-inch survey was commenced in Ireland. It was intended to publish a complete memoir of every parish surveyed; but this was carried out for only a very small portion of the country. I think only two parishes were published, when the Treasury found the expense so great that they decided to stop the work. Besides the volumes published, a very large amount of information was collected with regard to Ireland, and this is now kept in manuscript in the library of the Royal Irish Academy. It has been utilized by various writers on Ireland, but never published in complete form. I think the programme which Dr. Mill has drawn out is an extremely good one, and covers nearly all the ground necessary. It is in one way rather inconvenient to select a sheet as the unit, because the physical features very often run out of the sheet; but I do not see how you could very well adopt any other unit. The plan of first of all utilizing single sheets for the collection of information, and then grouping the sheets so as to include the principal physical features, is a good one. The only question is that of expense, and it is certainly a difficult one. The cost of this work will be very large, and I am afraid, from previous experience, that there is not much chance of obtaining a grant from the Government. What I would suggest, if it could be done, as a practical means of commencing this work, is to select certain typical sheets (for instance, sheets containing the Hog's Back, or some portions of the country well known to people in London), and to work these out thoroughly and publish them. Then, if the public take to them, as I am quite certain they will do if the work is well done, I think there would be no difficulty in getting the money to complete all the memoir. If the work turns out to be popular, pressure could be put upon the Government, through the House of Commons, to assist by a grant in aid; but I am afraid there is no hope of getting Government assistance to give effect to an abstract proposal of this kind. I think that, if three or four sheets were selected, and memoirs published, after the manner of the geological memoirs, success would be almost certain.

Colonel J. FARQUHARSON (Director-General of the Ordnance Survey): I agree with Sir Charles Wilson that this very important proposal, from the point of view of the General Ordnance Survey, would be of very great advantage, if it could be carried out; and I am also of the same opinion as Sir Charles Wilson, that the Government would not, in the first instance, undertake to be responsible for the very considerable expense involved. Perhaps Dr. Mill would allow me to make one or two remarks about the proposals themselves. I am not quite sure that I agree with Sir Charles Wilson as to the area of sheets being selected; I am not at all sure that it might not, on consideration, be found that political divisions, like a county, or a certain number of parishes or hundreds, might not be advantageous. In the first place, it seems to me, with areas so small, you would have more overlapping in the case of sheets than of counties. Certainly, with 800 areas, you would have a great deal more repetition than if you took a larger area to work upon. Supposing you took the counties, you would have from 115 to 120 areas to which you would have to apply your descriptions; and the county or parish must always be taken into consideration in questions of this kind. For instance, in the Statistical Account of Scotland, the parish was taken; and another point in that account is, that the memoirs are written by local people, very often the minister, and occasionally by the schoolmaster, and if you adopted these local areas, I fancy you would be more likely to get local people interested than if you took arbitrary areas like the survey sheets. Another point is, that I think you could hardly carry out this large scheme without considerable local assistance. It would be of very great assistance if you could get residents in the districts to join in these memoirs. There must be a great deal of information that a geographer from London would have more difficulty in getting at than people who have lived in the locality all their lives. Of course, it must be added that you could not always take the opinion of every local antiquary, or person with a fad, about the place-names or objects of interest in a county; still, with their assistance, you could get hold of a great deal of local information. Another point is as to the time. It seems to me that twenty years is too long. As regards the physical features of a country, it is not of so much consequence, but if you go into agricultural statistics, and elements of that kind, it seems to me that it would hardly do to have your information for Sussex, say, for the year 1900, and for Northumberland 1920. You would probably have to find some method, if possible, of curtailing the time. The only way is by increasing the staff of people who give you information, and I think you would be more likely to gain that by means of local assistance. That is all the criticism I have to make as to the main point. I feel no doubt that we are all agreed that it would be of great advantage to the country as a whole that this work should be undertaken.

Mr. H. J. MACKINDER: I can only add my humble opinion to that of the two directors of the Ordnance Survey, that we must greatly admire both the largeness of Dr. Mill's view and the practical character of the discussion with which he has supported it. The point which strikes me, in the first place, is that twenty years is from one point of view too short, and from another too long, for such a work as this. The physical description will take many years to complete; but even that will require to be repeated after a certain period, in view of the advancing character of the cognate sciences, such as geology. But the statistical description will have to be revised after every census. Therefore, on account of the advance of knowledge, and on account of changes in the facts themselves, it appears that the work should be completed in less than twenty years, and that revision will subsequently be required. Dr. Mill's proposition has a very important bearing on the development of geography in this country. He is really directing our attention to what

may be called "home-geography." Our geographical societies have given much attention to other lands; we are now asked to undertake the systematic investigation of our own country. This is a matter upon which foreigners often inquire of us in vain. Dr. Mill left the question of machinery for discussion by the meeting. We have already heard that there is very little chance of the Government doing anything. Though the Government should have the preparing of the Ordnance maps, the commenting on the maps is better undertaken as a private matter, though it might very legitimately have the assistance of a Government grant when shown to be of value. This description, it must be remembered, should be a work of art, not merely an accumulation of facts. There appears to me some danger, especially if the aid of persons living in the various localities be invoked, lest Dr. Mill's scheme should result in a heterogeneous heap of scientific bricks, in the place of a building on a consistent plan. The description throughout should be from the point of view of the geographer, not from those of various specialists, some trained in geology, some in botany, some in history. It appears to me that the result wished for would best be attained by the close co-operation of a group of men who see eye to eye, and are possessors of the same tradition. How that can best be ensured may be a matter of doubt, but with your permission, sir, I would like to express my idea upon the point. At the British Association Meeting at Ipswich, I ventured to express the opinion that a condition of further advance in English geography was the establishment of a central institution for the teaching of geography. Such an institution would be to geography what the Paris *École des Chartes* is to history. Now, research must go hand in hand with higher teaching. I believe, sir, it might be possible, if a real effort were made, to obtain in London, as an imperial centre, an institution working in harmony with this Geographical Society, and more or less controlled by it, which should have two sides to its work: on the one side, research; on the other, higher teaching. I believe, if some scheme were really worked out with these objects, that we could find some person with money and with imagination enough to give the necessary endowment as a nucleus. A large scheme is difficult to carry through; but a large scheme frequently captivates the imagination by its very audacity, and impels to the achievement of the end. It seems to me that you would get a large amount of research work done by students holding maintenance studentships. You would also have students coming from all parts of the country, and going back as schoolmasters and in various other capacities, with the point of view and geographical tradition of the central school, and also the local knowledge, so difficult of access to the non-resident. Thus, I believe, Dr. Mill's scheme could best be carried through, and could incidentally serve the purpose of creating a great school of English geographers.

Sir Benjamin Stone, M.P.: I came here rather as a listener, a patient listener, than to make observations of my own. I am rather afraid that recent observations have led me off the scent of the original paper; at any rate, I may be permitted to congratulate Dr. Mill on what he has laid before us, and would like to add words of encouragement for the carrying out of his idea. I confess there is a great deal of good in it if it is carried out in its entirety; at any rate, sufficient good in it, without help from Government or other sources where money is expected, for voluntary effort to do a great deal, and great enjoyment to be obtained. If Dr. Mill would put this into something like definite form, he would have done a great deal of good in starting the idea. There are serious difficulties in carrying it out in its entirety: the long time occupied in getting the information together, and the areas to be dealt with. My name has been mentioned in the paper in reference to this matter. I had some interest in taking part in the photographic survey of some part

of my own county, Warwick, which, in its elementary form, follows much the same lines as Dr. Mill proposes in his scheme. We took the Ordnance map, drew square lines across, reducing it to inches, and then we allotted the respective squares; for there is a large number of amateur photographers to be found everywhere nowadays, and spots of interest were indicated on these squares, where good and useful work could be done. In the course of two or three years, we have succeeded in getting a fair representation of the interesting matter in the county of Warwick. We have lodged in the free library at Birmingham about two thousand five hundred views, all done in permanent photography, that may be used for reference later on. During the process of that work, I confess that I have often been wishful that it should be supplemented by information on very much the same lines as described in this paper. You want to express in the text the facts that make the picture interesting—that opens the inquiry into place-names, physical conditions, ethnographical and ethnological matters, all of which should be recorded, many of which we have tried to put in pictorial form; but if such a scheme as Dr. Mill has mapped out could run side by side with such efforts as that, we might preserve invaluable material that is slipping away from us very readily at the present time, and that might be we can't tell of what use later on, because all scientific data are valuable in unknown directions. I don't know that the change brought about by facility of communication is reducing our type to one standard, but at any rate it reduces our language, and things of that kind, to much narrower limits than we are at first sight prepared to accept. We are losing dialect; many names are slipping away inadvertently through this change in education and the progress we are making. Take, for a single example, our board schools, on similar lines from one end of the kingdom to another, and these children learning the same language, common to the whole country, but dotted with dialects everywhere. One finds that in all parts of the country valuable information is going out of knowledge, simply because these dialects are dying out. They ought to be recorded, and any effort of this kind ought to have our encouragement in getting it into shape. I do not know what means Dr. Mill has behind him, but I hope this will not end with the paper. Don't trust to Government, or to some man dying and leaving you a large fortune, but put the scheme together, and you will find a large number of enthusiastic and well-meaning people anxious to give you information, invaluable in a few years hence. I can only congratulate Dr. Mill on what he has done, and wish it was in my power to do anything to further the object he has in view.

Mr. E. G. Ravenstein: I am sure we all desire that the scheme placed before us should be realized, and as some of us are advanced in years, it is to be hoped that it will be realized before the expiration of another twenty years, for if we are to wait so long, some among us may not have an opportunity of enjoying the fruits that are to be gathered during that long period. I am one of those who make light of difficulties, too light sometimes, and I don't think that the financial and other difficulties to be overcome are so very great. Remember that an encyclopædia, say in twenty volumes, quite as bulky as the proposed work, is written and issued in the course of four or five years, and it could be done quicker were it not necessary to spin the time out to suit the pockets of purchasers. The statistical account of Scotland was a private venture, and we hope that this thing will be a very superior affair to anything that could be produced a hundred years ago. You are aware that Government appointed and paid an editorial committee to bring out the 'Challenger Reports,' and I am sure that Government might be made to see the desirability of spending a like amount of money on a work of far more immediate importance to the people of this country, of greater interest to those who live in it, than the reports of the *Challenger* expedition. The materials are coming in

fast, being gathered now from day to day; the British Association are trying to carry out an anthropological survey of the British Islands, and are collecting information. The Geological Survey "we have always with us." Six or seven years before the last census was taken, the Statistical Society tried very hard to have this inquiry extended. They failed; but with a work of this sort in view, we could press upon the authorities with greater weight than the Statistical Society. Then, again, there is the agricultural department. At that time I told Sir Robert Giffen, that his agricultural returns were exceedingly useful to geographers, as they gave us something about the vegetation of the country, but that we wanted more detail; that he gave us counties, but that we should like to have parishes: as by adding, say, a forest in one corner of a county to that in another corner, the features of local distribution were obliterated. I was told that, in a census year, there would be no difficulty whatever in publishing the reports of every parish, and I have no doubt there are returns for years back, and we could make a comparison. There is one point on which I don't agree with Dr. Mill or Sir Charles Wilson, but with Colonel Farquharson. The sheets of the Ordnance maps are very attractive, but I don't think it would be wise to describe each sheet as a sheet. In the kingdom of Würtemburg, for instance, they have brought out a similar work in the form of a year-book, with general descriptions of the kingdom, and an account of every parish. That seems to me much better. Let us have the information Dr. Mill desires to give to the world arranged according to counties, as far as details are concerned, but let us have at the same time a number of volumes dealing with the facts on a broader basis, with climatology and so forth of the whole country; then taking separate regions, and dealing with these. This, I have no doubt, could be done exceedingly well, and would have to be done after the whole material for counties and parishes had been gathered. If you do the work by counties and parishes, you interfere, no doubt, with certain physical boundaries, but you interfere more if you take the limits of a sheet of the Ordnance Survey. In your regional descriptions, you will have to take boundaries more or less arbitrary. If you take the Pennine range, you will have to deal with it from various aspects, therefore you cannot draw sharp and fast lines and say: this we describe, and whatever lies outside we will not notice. You will secure another great advantage in taking the administrative county boundaries. If you take these counties and parishes, or groups of parishes—for there are parishes extending only over a few acres, whilst others occupy a whole sheet of the Ordnance Survey,—I say, then, if you take the county boundary and the parish boundary, you have two great advantages. One is this: that you place in the hands of the local teacher such a description of the county in which he lives and has his school as he can consult with great confidence, and take as a foundation for teaching, with great profit to his pupils, and great profit to the progress of geographical study. You have another advantage, a financial one. Nobody takes the slightest interest in a separate sheet of the Ordnance Survey—I don't think even Sir Charles Wilson does now, except as regards some of the older sheets—but we all take an interest in the parish we live in, we take an interest in the county we live in. There are many people exceedingly proud of their little counties, and if these could be made to take an interest in your work, they would help you financially. It is a patriotic work to produce such an account of a county, whilst a description of a sheet of the Ordnance Survey makes no appeal to patriotism whatever. I say, therefore, generalize, but go also into details, into what is called chorography and topography; take the existing boundaries, as known to the inhabitants.

The PRESIDENT: We have had a very interesting discussion, and I am very glad to hear that the principal officers of the Ordnance Survey are in favour of

Dr. Mill's scheme. For myself, I look on it as one of the greatest importance, and I trust that it may be combined with our plans connected with education in the way Mr. Mackinder contends for, or in some other way. I shall certainly bring the matter to the notice of our Council, and propose that the work of these memoirs should be carried on, under the auspices of the Council of the Royal Geographical Society. I shall ask them to appoint a small committee, in connection with the education committee of the Society, of experts on all the different subjects which would be combined in the memoirs, and that the Committee should receive instructions to find out and put themselves into communication with the innumerable institutions, in all parts of the United Kingdom, which occupy themselves in topographical and other work connected with the geographical memoirs, and also with the innumerable number of individuals living in many parts of the country, indeed, in every parish, who occupy themselves on one point or another which will be embraced in the memoirs. Such a Committee should also, I think, be asked to make an examination of all the materials, both general and local, which should be consulted, and they should consider the method of preparing the memoirs on the lines so well laid down by Dr. Mill. I think that Sir Charles Wilson's suggestion, that a sheet should be selected from a typical district before the scheme is officially decided upon, and that the memoir for that sheet should be published, with the whole scheme explained, with a view to attracting the public attention, is a good one. I should like, if there is time, to make a few remarks myself on the various details of Dr. Mill's scheme. We may divide the memoir into two parts—first, environment; and, secondly, the interaction of man on his environment. With regard to physiography, we should certainly, as Dr. Mill proposes, find a trained geographer to describe to us the type of land and the physical features of the region to be described. The elevations and depressions, and the mean elevation, would all be necessary in such a description; the drainage area, the soil, the minerals, and the climate. When we come to the interaction of man on such a country, we shall find the materials abundant. Of course, we should have our index and our list of place-names; and then we should come to the history of the disafforesting, the clearing, and the enclosing, for which there is ample material, at all events for many parts of the country. These operations had an effect on the climate, and on the movements of the population in various parts of the region described. We should then come to the question of drainage, reservoirs, and embankments; and then to the department of cultivation, of manufactures and trade, and the changes which have taken place—why Sussex has ceased to be an iron-producing county, why Suffolk and Norfolk have ceased to be the great manufacturing centre of England, and so forth. We must remember that each memoir must deal with the three statistical elements—the element of space, the survey; the element of number, the census; and the third, always the most important, the element of time; for it would be a very meagre account simply to tell about the population, cultivation, trade, and position of woods as they exist now. We want to know and compare these things with what they were a hundred, two hundred, three hundred years ago, back to the earliest period of history. The next subject, and, I think, one of the greatest importance, should be the question of communications. We should trace the directions of the Roman roads, and the causes why they took certain lines; then try to trace the *drengs*, as they call them in the north, the pack-horse roads of the Middle Ages—why they followed the Roman roads, why they left them, what directions they took, what markets they went to; then the coach-roads, the canals, and railroads. Lastly, we should consider the population, its movements, why it was thick in one part of the country in one period of our history, and almost depopulated in another;

and that would lead to the study of prices, markets, and trades. Numerous instructive details are to be gathered from Doomsday Book, from the Kirkby Inquest, from the records of the Poll Tax of the time of Richard II., and from other similar sources. In some places there is a solitary farmhouse where you find in the days of Richard II. a large village. Why has this movement of the population taken place? By collecting this material for the hundred, or the sheet, or whatever unit you like to take, and combining the information on a properly thought-out plan, you will produce a memoir of the very greatest interest—so interesting that the whole people of this country will be anxious that the work shall be completed. It ought to be completed in ten years, not twenty, because we must have a revision each census; therefore we must set to work to get it done in ten years. There is a vast number of people now occupied with studies of this kind, who, directly they hear a plan is formulated, will be anxious to give their help, besides numerous local institutions, which take their members about and describe different parts of the country and its history. We shall get help, no doubt, from some of the wealthier institutions, which will be willing to pay for work in their own parts of the country. No doubt wealthy individuals will also help. Then all these interests will form a leverage that will eventually induce the Government to grant subsidies for the completion of the work, which is of imperial interest. Other countries have not completed any such scheme, probably from want of funds, but the work has been done in India to a large extent. In the Madras Presidency there are memoirs of the collectorates, which formed the materials for Hunter's famous 'Imperial Gazetteer.' Of course, we shall expect that these memoirs, completed as Dr. Mill suggests, will lead to the preparation of histories of important larger districts, and eventually to a geographical description of the whole British Islands. I think that it is the duty of a Society like ours to take the lead in a great imperial work of the kind, and I think we all owe thanks to Dr. Mill for bringing so important a matter before us. Possibly Dr. Mill would like to make a few remarks before the meeting closes.

Dr. MILL: I may say that my ideas are purely provisional, and I am extremely glad that the opinions expressed have been so various, because it shows that the speakers took a vital interest in this subject. I shall consider them, and, if I can, assist in carrying on the scheme. I agree with Mr. Mackinder as to the importance of such a scheme from an educational point of view. I think that in the higher geographical education of this country field-work is extremely important. There are some calculations which must be made from the individual sheets, because in treating complicated lines of boundaries, parishes, and counties, one is liable to make mistakes, and the sheets, for the most part, are terminated by straight lines at right angles. With regard to the unit, the county or parish might certainly be employed, although it might be less convenient to estimate the average elevation of the parish as compared with the sheet, and similarly with regard to the measurements of the lengths of rivers.

The PRESIDENT: It now only remains to pass a very hearty vote of thanks to Dr. Mill for having given us an interesting meeting.

With reference to Dr. Mill's proposal, Professor H. G. SEELEY, F.R.S., writes: I entirely agree with the spirit of Dr. Mill's proposal that a complete description of our own country should be made as an expression of geographical knowledge. It would concentrate scientific interests which are scattered, accumulate facts of great value in education, and stimulate the whole population to observe and think about the conditions of industries and circumstances of the Earth's surface under which they are carried on. Such results would justify faith that the work, well done,

would be practically useful. The only differences of opinion are likely to concern the scope and method of the work, and the authority which should contribute the means to carry it through. The conception of geographical science and method which Dr. Mill adopts is the method which I have used for many years and tested in King's College, both in gaining knowledge and in imparting it practically. Dr. Mill's distinctive proposal is to apply this method to description of each sheet of the map known as the New Ordnance Survey, and to embody in each memoir as much as can be stated, concerning the Earth's surface and the people who live upon it. Such a description should, I think, be based upon personal knowledge of the districts described. It may be supposed to meet the wants of the younger people undergoing education, as well as of the adult producing population, landowners, occupiers, farmers, manufacturers, traders; and to give a summary, in a handy form for reference, of many of the groups of facts with which the geographer is occupied. From the educational point of view, the map-sheet is sometimes too large, sometimes too small. I have taught physical geography with the aid of these maps practically with the London Geological Field Class; and for ten years we have visited districts between the Chiltern Hills and South Downs. The area which can be studied practically in course of a day rarely exceeds 10 or 12 square miles. On this experience, I believe the facts described in relation to the map must always be such as can be actually seen in nature. Every teacher, even in the most elementary schools, must, I believe, make his own local description from the maps of his own district, and for that no book can ever be an adequate substitute. But the single-sheet map is too small for description, when the interest and meaning of such physical features of the country as streams or hill ranges can only become intelligible by tracing them into adjoining districts. Dr. Mill's second proposal, to generalize these details from the memoirs on the individual sheets of the map into a series of memoirs upon the different natural regions of the country, would be of great value if it could be carried out. I have had to prepare materials for some such memoirs for my lectures, but the only practicable method has been to describe the country on the basis of personal examination, grouping the phenomena mainly into those associated with rivers and valleys on the one hand, and those connected with hills on the other. In describing these physical features, it has been necessary in all cases to dissect the map and separate the valleys from the hills as results of geological structure and the circumstances of their origin. The natural divisions of the country which are suitable for description are only to be defined on the basis of geological structure. Any conception of the Weald of Kent, Surrey, and Sussex which did not recognize its relation to the Mendip Hills, would only partially express the knowledge of the practical geographer. Many of the physical characteristics of the people, and their industries and habits in relation to the land and its produce, admit of being recorded upon maps of smaller size. The map need be no larger than will show the registration area. I have used such maps to express the weight, stature, and other physical characteristics of the people, as well as observance of law and order, habits of thrift, and other characteristics for which data are available. But every such circumstance needs to be considered in relation to the several parts of the country and the industries carried on, otherwise the inference from statistics is often misleading. The heroic magnitude of the work makes its realization proportionately difficult, but I trust that the President and Council may consider means of giving effect to Dr. Mill's proposals.

Mr. G. G. Chisholm writes to Dr. Mill: If there had been time for me to say anything this afternoon on your "proposed Geographical Description of the British Isles," as you requested, I should first of all have expressed my very hearty appreciation of your magnificent scheme. I intended also to deprecate

any alarm at its magnitude, and to suggest that you should not say anything in advance tending to minimize its scope. I was glad to see that you looked upon your estimates of the magnitude of the work as mere guesses, for before the plan is finally matured and defined I think it would be well to submit the whole scheme to detailed consideration and discussion, and to seek the advice of representatives of various sciences interested in geography. I meant to make one or two suggestions myself as to the scope of the work, but merely as specimens of an abundance of topics that might be submitted for consideration and discussion if the whole scheme were laid before all those likely to be strongly interested in it. Taking your own conception of the final object of geography as "the true understanding of the interaction of man with his terrestrial environment" as the sound one, I am inclined to think that the part of the work that would be regarded with most interest when completed, is that which threw light on the changes that had taken place in that environment since these islands first appear in history. For that reason I was going to make the same suggestion as the President made as to the attention that should be paid to the progress of the clearing of forests, draining of marshes, and the extension of enclosures. I think that all the Enclosure Acts should be consulted, so as to get, so far as possible, the whole history of enclosures. Among other historical data that should be carefully noted on account of their geographical import, I think we should include the position and wealth of monasteries. I will give an illustration. Coventry is one of our oldest manufacturing towns. It has been a manufacturing town in some branch or other, or in several branches, at all periods of its history as far back as we had any distinctive manufacturing towns at all. Thorold Rogers, speaking of its early importance in this respect (in the fifteenth century, or even perhaps earlier), says that he can see no local reasons for this pre-eminence. Probably no really geographical reason can be given, and Dugdale is no doubt right when he attributes all the importance of the town to the wealthy monastery founded there in Edward the Confessor's time. Further, I was going to suggest that special attention should be given to historical notes as to the introduction of improvements in agriculture or the arts from abroad, either by foreigners who settled in England or by Englishmen who had travelled abroad. As to roads, too, there are many points of interest. A wrong idea is sometimes conveyed by descriptions of the frightful state of the roads in certain localities, the impression being conveyed that that was general in the times spoken of. There may have been very decent roads on the chalk (say along the Hog's Back or on the route of the Icknield Way, which seems to have been a track at a very early date), when the roads were as bad as bad could be on the Gault clay or on the shales between the now large towns of Lancashire and Yorkshire. As to the points to notice at the present day, I think it might be worth while to make inquiries as to the average size of fields in parishes or other localities. My reason is this. A large part of the success of foreign competition in wheat-growing at the present day is due to the ease with which modern agricultural machinery can be used over large expanses of unbroken level land. We speak of the competition of the United States, Canada, etc., naturally enough; but the really successful competition is restricted to certain favoured districts in these countries, wheat-growing declining in other parts of the same countries even more rapidly than in England. In the fen country we have stretches of flat country as good as any in Manitoba or Dakota, but probably hedges and ditches would interfere with their being cultivated in the same way as the Red River valley. For the sake of collecting information that might be utilized in any county, it might be well to draw up a list of works, to be read specially for the compilation of the proposed memoirs. In this, I don't doubt, a good deal of voluntary co-operation

might be obtained, as, I understand, is or was the case in reading for the Philological Society's dictionary. These general works would all have to be read before the first memoir was issued. I think there is a good deal in Mr. Ravenstein's suggestion of the county or the parish as the unit for description, on the ground that people have a special interest in their own county or parish, whatever it may be. I think, too, it would facilitate the obtaining of voluntary co-operation through the officials of the administrative counties. But, whatever be the larger unit, I think the parishes should all be separately described (preferably, perhaps, the mother-parishes), on the ground that the parish is really the unit of the economic development of the country. The utilizing of local co-operation should present no great difficulty. Of course, no local man would be asked to write an account of his parish according to his own fancy, but a carefully compiled list of definite questions would be submitted to him, and he would answer such as he could. There are a number of minor points I should be glad to talk to you about, but which are not worth writing about. As for the money, if the Royal Geographical Society supports your scheme as the Philological Society supports the English dictionary, which I hope it will, I have no doubt that all necessary funds will be forthcoming from the "not impossible millionaire" or millionaires.

THE DISCOVERY OF THE MOLUCCAS.*

By Dr. O. WARBURG.

ACCORDING to two entirely independent versions, the discovery of these islands is ascribed to a Portuguese and to an Italian, and it is remarkable that the claims of these two explorers should not have been fully discussed before now, considering the immense influence the discovery must have had upon the political situation of the time, and its undoubted importance as a landmark of historical geography.

The story which until recently found universal acceptance rests on the accounts of the old Portuguese historians, and, in particular, on the 'Asia' of Barros. Barros was in possession of documents from the Indian archives, and from these reliable sources derived the detailed description of the fitting out of the first expedition to the Moluccas, to be found in his volume printed in 1561 (lib. 6, cap. 7). After the capture of Malacca by the Portuguese in 1511, Albuquerque at once despatched three ships with 120 men to explore the Moluccas. The chief command was entrusted to Antonio d'Abreo, and the two other ships were placed in charge of Francisco Serrano and Simon Affonso. Malay pilots were taken on board at Java, and the ships proceeded to Amboyna, and thence to Banda, where some profitable trading was done. Being prevented by stress of weather from reaching the northern Moluccas, d'Abreo returned to Malacca, and shortly afterwards sailed for Portugal, intending to present an account of his experiences to King Emanuel in person. He died on the voyage. Francisco Serrano had already lost his vessel by shipwreck on the voyage to Banda: at Banda he bought a native junk, which was also lost on the return voyage. With great difficulty he reached Amboyna, whence he was called to assist the king of Ternate against the king of Tidore; he followed the sultan of Ternate to the Moluccas, attained great influence, and settled there permanently. Serrano's letters to his friend and relative, Magellan, were the means of inducing the latter to undertake his famous voyage round the world; but he did not live to see the arrival of the remainder of Magellan's fleet, dying by poison in the year 1511.

* Abstract of Paper read at the Berlin Geographical Society, February 8, 1896.

According to this version, which is accepted by all the Portuguese, Spanish, and French historians of the following century, d'Abreo is the discoverer of Amboyna and Banda, and Serrano of the northern Moluccas. More modern writers, such as Crawfurd, Soltau, Berghaus, Peschel, Major, Bokemeyer, and many others, give the same story; nowhere do we find a hint that the Moluccas had been previously visited by Europeans, nor any suggestion of a different account existing. Nevertheless, in the narrative of the great journey of Ludovico Varthema, first published in Rome in Italian in 1510, that adventurous traveller gives a detailed description of a visit to the Moluccas made in the year 1505, in company with certain Nestorian Christians. Setting out from Sumatra, in fifteen days they came to the island of Banda, in twelve more to Monoch (Molucca). From Molucca Varthema went to Borneo, and thence to Java, 200 miles from Molucca and five days' journey from Borneo. From Java he returned to Malacca, and reached home, after many adventures, in 1508.

Varthema's book produced a great impression in Europe, as may be gathered from the fact that no less than thirty-six editions are known to have been published in various languages during the sixteenth and seventeenth centuries alone, and it is therefore surprising that the Italians should have failed to maintain the claims of their countryman to priority, leaving it to Dutch geographers and historians of modern times to recognize in Varthema the true discoverer of the Moluccas. A comparison of dates would nevertheless seem to dispose of the question, were it not that a close examination of Varthema's account gives rise to suspicions of his veracity, ultimately leading to the conclusion that the distinguished traveller never visited the Moluccas at all, but based an account of them on hearsay and imagination. The descriptions of the nutmeg and clove trees, for example, render it inconceivable that the writer had ever seen either; the nutmeg is as little like a peach-tree as the clove-tree is like a box-tree. Again, we are told that Banda is a single island about 100 miles in circumference, very ugly and gloomy, low and flat, wherein the seasons are the same as ours! The inhabitants of the Spice islands are further described as heathenish, bestial, stupid, and feeble in mind and body, having no king or government, whereas we know the Bandanese as a race of capable, intelligent traders, who even in Varthema's time were partly Mohammedans; and the same is true of the natives of the Moluccas themselves, who are nevertheless stated to be even lower in type than the Bandanese. Finally, by his own showing, it appears that the journey could not have been accomplished, in the miserable Chinese sampan described, within the time named.

In the Hakluyt Society's edition of Varthema's travels, the difficulty of bringing the narrative into accord with known facts relating to Java is sufficiently obvious, and we must leave Varthema out of the running in the competition for the honour of discovering the Spice islands.

THE GEOGRAPHY AND RESOURCES OF BRITISH CENTRAL AFRICA.

By ALFRED SHARPE.

In 1894, Sir H. H. Johnston, Her Majesty's Commissioner and Consul-General, read a paper before the Society, describing British Central Africa, and showing the advance which had been made during the three years of his administration. I feel, therefore, that I am at some disadvantage in treating of the same themes after so short an interval.

British Central Africa—that is, the portion of Central Africa belonging to Great Britain which lies immediately north of the Zambezi—may be roughly divided into two parts: eastern and western. The former is bounded by the Shire and Nyasa on the east; by German and Free State territory and by the south end of Tanganyika on the north; by Mweru, the Luapula river, and a line drawn south to the Zambezi at the Loangwa mouth on the west; and by Portuguese territory on the south. The western portion contains the Barotse, Mashukulombe, and other countries, and is chiefly watered by the Upper Zambezi affluents and the Kafue. Of this western portion I know nothing—from personal observation. It is the eastern section of which I am to speak, and which I will refer to, for brevity's sake, as B.C.A. Perhaps the chief noticeable feature about this country is the large amount of navigable waters which it possesses. Its actual boundaries, roughly measured, reach to some 1900 miles—that is, including, for geographical consideration, the Portuguese country lying north of the Zambezi; and out of this distance, some 1200 to 1300 miles can be travelled by boat or by steamer. Commencing at the junction of the Shire with the Zambezi, we have steamer communication to the north end of Nyasa (with a 60-mile break at the Shire highlands); we can sail across the foot of Lake Tanganyika; from the north end of Mweru we have communication by boats for the length of that lake and up the Luapula river to lat. 10° 30′ 46″; from the northern end of Lake Bangweolo, again, we could boat down to about lat. 12° 30′ on the Luapula; taking advantage of the lower portion of the Loangwa, we could then navigate that river and the Zambezi (with one portage) back again to the Zambezi-Shire junction. I believe, also, that the Chambezi river will prove to be navigable for small craft for a considerable portion of its length before entering Lake Bangweolo, as the difference of level between that lake and the Chambezi sources on the Nyasa-Tanganyika plateau is probably not more than some 200 feet; and Awemba people, through whose country the river runs, have told me that long journeys are made by canoe on the river. With the exception of the Shire, Luapula, Loangwa, and Chambezi, I know of no other rivers in the country which are navigable for any useful distance.

The greater part of B.C.A. is high-lying plateau land—almost the whole of it, we might say—situated at elevations of from 3000 to 6000 feet, the only low portions being the countries lying near to the shores of Lakes Nyasa, Tanganyika, and Mweru, and the valleys of the Shire, Luapula, and Loangwa rivers.

With regard to the drying up or otherwise of African lakes and rivers, I am inclined to doubt the theory that there is desiccation of a permanent kind going on—that is, I mean, a drying up due to a *permanently decreasing rainfall*. It is, I think, more reasonable to suppose that, owing to some cause which is not as yet apparent, there

are regular cycles in the lake regions of Africa, due to increasing and decreasing rainfalls. The knowledge which we possess of the rises and falls of Tanganyika certainly goes to show this. Lake Mweru is being rapidly *silted* up at its southern end by the Luapula river; the vast marshes which exist there were formerly part of the lake. The great Mweru marsh, lying to the east, was also a lake comparatively recently. It appears to have dried up, or rather to have become marsh, from the same causes which are now converting Lakes Shirwa and Pamalombe into marshes, *i.e.* one or two unusually dry years have allowed vegetation to get a hold in their shallow muddy bottoms; and, once so started, the growths rapidly spread. From what we know of Bangweolo, it appears to be filling up in the same manner, at its southern end at any rate, and this will probably be due to the silt and vegetable matter brought down by the Chambezi river. With regard to Nyasa, there have been changes of considerable magnitude in the level of that lake during past ages, as shown by the number of beaches, one above another, and by water-marks on the rocks. I do not think there has been much recent change in its level, though during the last year or two the exit of the Shiré river from the lake has become more difficult (more shallow) for steamers.

As to the Shire river, one hears many conflicting opinions expressed by those who navigate it. I think myself that there has been little *permanent* change in it since Livingstone first ascended it. We have good years and bad ones, sometimes two or three bad ones in succession, and at such times the opinion grows that it is becoming shallower. In any case, we may always look on Chiromo as the farthest point of navigation for steam traffic. During the rains steamers can at times fetch Katunga and Chikwawa, but during two-thirds to three-fourths of the year Chiromo is the farthest point which can be reached; and, indeed, there are times when steamers are compelled, by the lowness of the river, to discharge their cargos at Port Herald, some miles below Chiromo.

I have recently received from Lieut. Gurney, R.N. (who was for some time in command of the gunboats on Lake Nyasa), a chart showing the interesting results of his soundings with the deep-sea apparatus on the lake. From this it will be seen that in the upper (northern) half of the lake, there is a line of soundings where no bottom is found at 1800 feet (300 fathoms). As the surface of the lake is some 1500 feet above sea-level, we thus perceive that the bottom of Nyasa is more than 300 feet below the level of the sea; how much more we cannot at present say, as the gunboats were only supplied with 300 fathoms (1800 feet) of wire. What conclusion can be drawn from this curious fact, or whether it is likely to assist in the settlement of the question as to how Lake Nyasa was originally formed, I leave to other more scientific persons to say. In the portion of the lake where the greatest depths were found, it is notable that the mountains on

either side rise to a great height. The ranges behind Ruarwe are over 6000 feet above sea-level, and the mountains on the east side opposite Ruarwe, reach to about a similar altitude. It will be observed that the southern half of Nyasa is considerably shallower than the northern portion, and also that the mountains on either side of the lake are there lower than in the northern part. At the extreme north, the mountains rise on the east to fully 10,000 feet, on the west to some 7000 feet; but although the lake is there deeper than it is at the southern end, it does not reach the extreme depths found opposite Ruarwe. It is, I think, possible that this is due to the fact that the



THE ZAMBEZI NEAR CHAPINGA.

numerous large rivers entering the lake at its northern extremity have deposited sand and mud for a long distance out, and that the true bottom of the lake at the north end may have been deeper than in any other part. Lakes Nyasa, Tanganyika, and Mweru in their leading features are much alike; they are all clefts or dykes in a high-lying country, of considerable length and little breadth.

At the north end of Nyasa there is an interesting volcanic region, covering an extent of about 30 miles by 20, in which are found numerous craters of all sizes, from small mounds of 40 or 50 yards in diameter at the base, to Rungwe mountain, the topmost crater of which is some 8000 feet above sea-level. None of these are active in the slightest degree, but there are numerous hot springs in their neighbourhood. The district is enclosed by the high ranges east and west of the lake, which at its north end gradually curve round and join, forming

a bow, to the north of Nyasa. Rungwe itself is about the centre of this volcanic region. I ascended to within some 1000 or 1200 feet of its summit in 1889, and passed three large craters on my way up, one of which was partially filled with water. Some of these small crater lakes are very beautiful, notably one locally known as Kiziwa. The greater part of this volcanic country is within German territory. The surface of the ground has much pumice-stone in it, but the soil itself is very rich, and well suited for the growth of coffee.

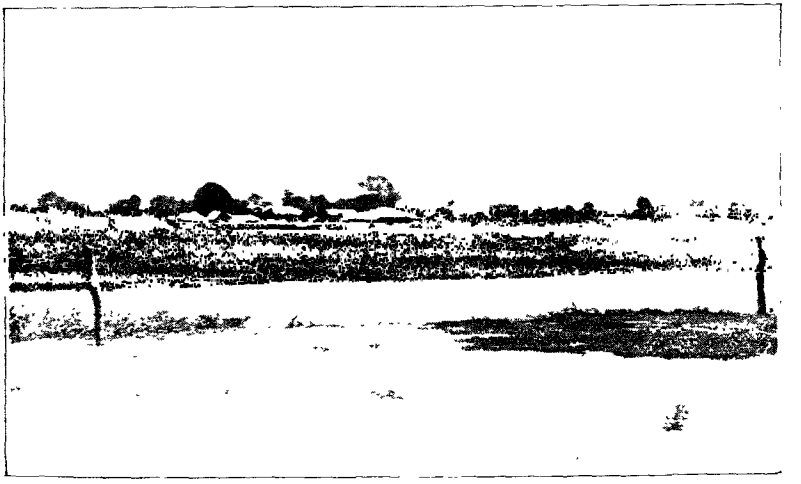
Mlanje mountain, in the Shire highlands, is the highest which has been actually ascended in B.C.A. In the end of 1894, together with Captain Manning, I climbed to the topmost peak, which we found to be 9680 feet above sea-level. Sir H. H. Johnston has already described the characteristics of this peculiar mountain range, and has spoken of the forests of cypress which exist there.

In 1889, I made a journey from the Shire highlands through the countries lying north of the Zambezi, towards the Loangwa river, reaching as far as Undi, and passing through the northern portion of Makanga country, and through what was, a century or two ago, known among the Portuguese as the "Maravi" kingdom. Parts of Makanga and Maravi are rich in minerals. Gold has been obtained in small quantities in the river-beds for some hundreds of years past by natives, and I was informed of the existence of silver, tin, and copper. The people who centuries ago carried on such vast gold-mining operations in Matabeleland and Mashonaland do not appear to have worked north of the Zambezi. I have seen myself, in the Maravi country, remains of alluvial workings carried on by Portuguese half-castes some fifty to a hundred years ago; but I have never seen or heard of any old workings in quartz reefs north of the river. It is not beyond the bounds of possibility that payable gold-fields may be discovered in British Africa immediately north of the Zambezi.

Throughout the greater part of this journey I travelled through pleasant high-lying country, with a comparatively healthy climate, the general elevation being from 3000 to 4000 feet above sea-level. An account of this journey appeared some years ago in this Society's *Journal*.

In 1890 I travelled from Leopard bay, on the west shores of Lake Nyasa, through elevated plateau land, between the lake and the Loangwa river, and followed that river down to its junction with the Zambezi at Zumbo. The country between the lake and the Loangwa is mostly high and occupied by "Angoni," a remnant of some Matabele who crossed the Zambesi and travelled northwards about fifty years ago. The history of their migration, as given by some of the old original immigrants, is an interesting one. They spent a number of years wandering from one district to another, and eventually settled down in groups in the high country west and east of Lake Nyasa. In the first instance, they travelled up the west side of that lake

until they reached the north end, from whence they went north-west through the districts of the Awemba tribe, to the south end of Lake Tanganyika. Subsequently they retraced their steps, and settled for a time in the Awemba country. That tribe adopted many of their customs, especially their way of fighting, and, becoming too strong for the Angoni, drove them out. The latter then divided at the north end of Lake Nyasa; a large detachment went down the east side of the lake, settled in the high country there, and are now known as Magwangwara. The rest again descended the west side of Nyasa. Some of them, under two or three powerful chiefs, established themselves in



PORTUGUESE CHIROMO, ON THE RUO.

what is known as Mombera's country; another division proceeded still further south, under a chief called M'peseni, and fixed themselves in the northern portion of Undi's country, where they now are; while a third division under Chikusi subsequently settled at the sources of the Revubwe river.

Throughout all these high countries inhabited by the Angoni, there are only a few of the original Matabele left, as much intermarriage with local tribes has gone on. They still keep up the Zulu war customs, fight with the spear and shield, and decorate themselves with feathers, skins and tails of leopards, cats, etc. Their business is war, raiding other weaker tribes, and catching slaves; and wherever Angoni are settled there is always found a belt of uninhabited country surrounding them, immediately beyond which the local tribes lead a wretched existence, their huts built in rocky hilltops, their food gardens situated in the most inaccessible places, and tilled in fear and trembling.

It is curious that, from the southern extremity of Africa to the Nile

itself, there is found a succession of tribes more warlike than the general run of Africans, with similar customs and characteristics; they are cattle-keepers, fight with the shield and spear, live only in high country, are professional raiders, and despise agriculture. Commencing with the Zulus in the south, we come to the Matabele, the Angoni, the Awemba, the Masai, and others. The only tribes in B.C.A. who have been able to make any stand against these are such as have acquired guns and gunpowder; and in this particular respect only it might almost be said that guns and powder have done some little good in B.C.A., as in one or two instances local tribes have by this means been enabled to retain their countries, though harassed by the Angoni.

The Loangwa, which I navigated in canoes down to the Zambezi, can hardly be called a navigable river. The lower portion, from Zumbo for about 50 or 60 miles up, might be used during four to six months of the year by shallow-draft steamers drawing not over 15 inches. The rapids above Chirowe could be ascended by no craft (I lost three canoes while descending them); but above the rapids, upwards to Muliro, small shallow-draft steamers might ply for a few months during the rains. The current, however, throughout is very strong. When I travelled down the Loangwa, its whole course practically was uninhabited, the valley having been raided and devastated by Zambezi half-castes. I saw the remains of numerous burnt villages, skulls, and bones, but hardly any living inhabitants.

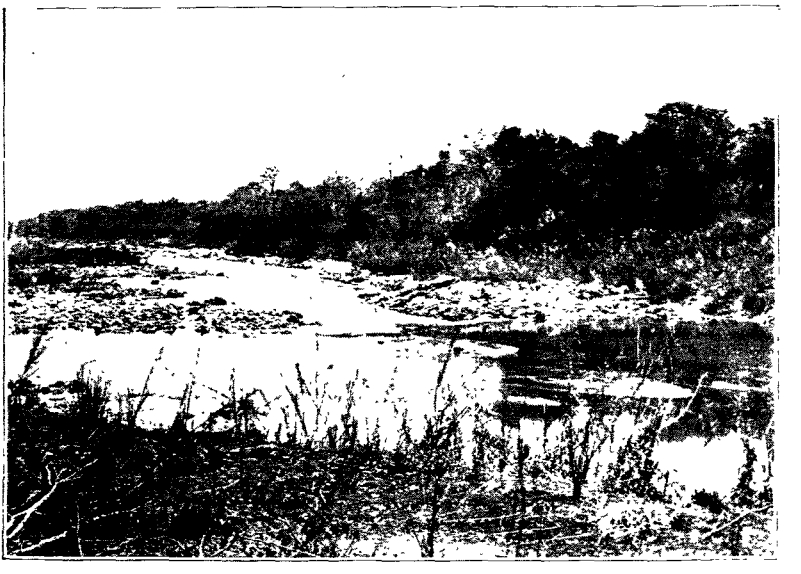
In the end of 1890, I made a journey from the south end of Tanganyika to Lake Mweru and the Katanga country, a report of which has also appeared in this Society's *Journal*.

In a subsequent journey which I made to Lake Mweru in 1892, I circumnavigated that lake in a steel section boat, and followed the Luapula river up to its cataracts in lat. 10° 30′ 46″. The Tanganyika-Nyasa plateau has already been described in papers read before this Society by Sir H. H. Johnston and others. When one leaves Tanganyika and proceeds west to Mweru, the country passed through is hardly so suitable for any attempts at settlement by Europeans as the Tanganyika-Nyasa plateau. Not only is the elevation rather lower, and the climate in consequence warmer, but also there appears to be in Itawa a longer dry season, and a severer wet one. Itawa is a country of vast plains and swamps for the most part. Lunda again (Kazembe's) is a very fertile, though comparatively hot, country, well watered by permanent streams of running water, and having a more luxuriant vegetation than the districts lying north of it. At the south end of Lake Mweru, on the Luapula, and on the island of Kilwa, the oil palm flourishes. This was probably brought from West Africa, as Kazembe's ancestors came from the Kasai river.

Uwemba, the country of the Awemba, from what we as yet know of

it, seems to have large districts possessing a pleasant mild climate, where coffee, wheat, and other useful products might be grown by Europeans. It has been difficult hitherto to enter this country, owing to the desire on the part of the Arabs, who visit it, to keep us out as long as possible. They have used their best endeavours to persuade the Awemba to exclude us. During the last two years, however, a great deal has been done towards opening up friendly relations with the Awemba by Mr. Poulett-Weatherley, who has been travelling, hunting, and collecting in the borders of their country, and who has acquired considerable influence with them.

In the districts east of the north end of Lake Mweru, large quantities



UPPER SHIRE RAPIDS.

of salt are made by the natives. Salt-impregnated earth is collected and carried into the villages; here every one is a salt-maker. Large funnels made of twisted grass rope are placed on stands; the funnel is filled with salt soil, water is poured in, and the mass well stirred up. The water filters through, and drops from the bottom of the funnel into earthenware pots placed below. This salt water is then boiled, and the water evaporated. A certain amount of dirt remains with the salt, but the African has no objection to that; he likes this home-made salt better than our own white table salt. Itawa salt is carried to places far distant, even to Nyasa, and is exchanged for hoes, cattle, wives, and other African barter. It would, of course, have no value for export, but is a source of wealth to the natives.

From 1887 to 1890 I was chiefly employed in travelling and

hunting. At that time there were still left considerable numbers of elephants in the Nyasa districts, and most of my shooting was done within no great distance of the lake. The elephant is gradually disappearing in B.C.A. This, however, is not due to the number killed by Europeans (which, as a matter of fact, is very small), but to the fact that the natives throughout the country are constantly destroying them. In the marshes round about Lake Mweru considerable quantities are still to be found, and, of course, farther north they are yet plentiful. In B.C.A. it is necessary to take out a £25 licence for the hunting of elephants; but in a country where stations are so few and Africans so plentiful, it is no easy matter to keep a check on native hunters.

The coffee-planting industry of the Shire highlands has steadily grown. This district lies, roughly, from 60 to 100 miles south of Lake Nyasa, in S. lat. 15° to 17°, at an average elevation of some 3000 feet above sea-level. Dr. Livingstone chose it as being suitable for an experiment in Central African colonization. He held the opinion that it was possible, in what appeared to be healthy, high-lying country, to form colonies of Europeans—and undoubtedly he could not have chosen a more suitable district for such an experiment. The existence at the present day of this thriving young British settlement is due in the first instance to missionary enterprise. The prospects of the new industry are very hopeful. For several years the export of coffee has been doubling itself, and although the total amount which has been exported during the past season is trifling as compared with that from large coffee-producing countries, it is possible, I think, that at some future date B.C.A. may be one of the great coffee countries of the world. It is not only that the plant grows well, produces a fair average crop, and is as yet free from leaf disease, but also that suitable land is cheap, and the cost of transport to the coast moderate. The chief point, however, about coffee cultivation in this country is that native unskilled labour is very cheap, and the supply practically inexhaustible.

With respect to this question of a supply of unskilled labour within tropical Africa, it has been stated that, judging from the experience of explorers and others who have spent many years of their lives in Africa, the negro will never be brought to work regularly except with a system of forced labour or under the pressure of slavery. This is in complete opposition to actual experience in the Shire highlands. This district offers an object-lesson to all who doubt the native African's capacity for work. The settlement is now some twenty years old, and has passed far beyond the experimental stage. If there is one question which has been proved thereby, it is that we need have little fear, in Central African settlements, of a scarcity of unskilled labour, and also that we can depend, in course of time, on a certain amount of moderately skilled labour. Our experience has been that there are three stages of the labour question: in the first instance, when

undertakings requiring unskilled labour are commenced, there is a scarcity until the natives have gained confidence in the new settlers; then there is a great flocking in of local people. After a time many of the immediately local men begin to learn skilled work, such as carpentry, timber-sawing, brick burning and moulding, bricklaying, overseering, bullock-driving, etc. They soon perceive that such occupations involve less irksome toil, have some interest, and command much higher wages than mere unskilled labour; meanwhile the news that calico and other valuables are to be earned has spread, and every year natives come in from more distant districts to obtain unskilled work. These people agree to work for a fixed term of six months, at the termination of which they



SOUTH END OF LAKE NYASA.

return to their own homes simply because they want to make use of the goods they have earned, and to till their land. It has been found at Blantyre that the same men return again and again in succeeding years. Wives and families have to be supported and looked after in Africa just as much as in our own country, and also the negro is, in his own way, as eager about returning to visit his home as we are. Having by his half-year's work earned enough calico to clothe himself and his family and to purchase what articles he may require, he sets to work to clear and plant his own food-garden, without which his people would starve; probably in the following year he will come again to Blantyre or elsewhere for work. So far from there being any scarcity of labour in these regions, during the year 1894, in spite of the large increase of planting operations, more labourers came into Blantyre from

Lake Nyasa than could be well utilized. The supposition that natives living immediately round the European settlements decline all work is an incorrect one. It is quite true that there are few such who can be relied on to do the field work of raw hands. They not only—as I have already stated—learn skilled work, but also undertake the serious question of food-supply; large quantities of grain are grown in the Shire highlands by local natives with the sole object of sale to the incoming labourers. Under a stable government, even the African cannot live without doing a certain amount of work; otherwise, although he might have no great difficulty in obtaining his food, he would be unable to procure his own calico and the gaudy prints and handkerchiefs which his wives and family require, all of which, in the more settled districts of B.C.A., have now become necessaries, and are no longer luxuries. The labour supply in the Shire highlands has grown gradually with the demand. If there had been a sudden very large demand required at once, it would have been difficult to supply it. Thus it is possible that, in railway construction in Africa, some introduced labour might at the commencement be needed.

With regard to "gin, guns, and gunpowder," none of these articles are allowed to be sold, given, or disposed of throughout the greater part of our Central African territories. Within B.C.A., the bulk of the native population have never seen, tasted, or heard of imported spirit. Alcohol has never been an article of commerce in British Central or East Africa, and the natives, with the exception of those who live on the coast or who visit it, have no desire for it.

It has been said that tropical Africa is capable of only a limited degree of development; that throughout the continent natives acquire all the vices and none of the virtues of Europeans in whose neighbourhood they may have built their huts; that little progress has ever been seen in tropical Africa; that the natives have not progressed, but have deteriorated, wherever they may have been long in contact with Europeans; and so on. These are undoubtedly pessimistic views, and are as incorrect and harmful as the ultra-optimistic ones. For my own part, I can only speak of B.C.A. Within that portion of the continent, however, I can confidently say that the country is capable of very great development, and that the natives have *not* deteriorated through their contact with Europeans; they have, on the contrary, much improved, and have adopted a certain amount of civilization. We have already a revenue of over 10,000*l.* for the B.C.A. Protectorate; exports and imports are steadily increasing; we have a settled agricultural industry; the influx of a good class of European settler continues; labour is plentiful and cheap; traders and planters find that they can profitably invest money in the country; steamers ply on the rivers and lakes, and freights have gone down some 50 per cent. within the last year or two; the main roads have been improved and rendered safe, and journeys

can be made in half the time they occupied a few years ago; and our total trade for 1894 amounted to £80,000,—all of which shows *progress*, I think.

With regard to the native. In districts around or near to our settlements, in place of constant warfare and slave raids he has peace and an appeal to justice; he lives in better houses than he did; he clothes himself in calico, prints, and in some cases European manufactured garments, instead of bark cloth and skins; he has formed permanent settlements round our stations, and is relying more on settled occupations; and he has also taken, as I have said, to skilled and regular work.



YAO VILLAGE, BLANTYRE.

Large numbers of children attend the mission schools, and a considerable portion of the rising generation in the neighbourhood of the missions are able to read and write. Native agriculture has increased, and some of the more ambitious have, in the Blantyre and Zomba districts, gone in for the cultivation of coffee and wheat. Native boys have taken readily to telegraph work (and I might mention that, at the time of my departure from Blantyre, the telegraph office there was in sole charge of an African, who had been taught his work by one of our Sikh telegraph operators); and I have little doubt that, as the African trans-continental line is carried on, it will be found that most of the operating will be done by Africans under European inspection. We have also a staff of native heliograph workers.

The only natives with whom we have had trouble and fighting in B.C.A., and to whom our presence is distasteful, are the Yaos. This

tribe is one of professional slave-traders, and many of them live by robbery. They inhabit the country lying east of the Shire and Lake Nyasa, and are gathered round several powerful chiefs, whose towns are centres of the slave trade, and calling-places for Arab and other coast caravans going to and from the interior. Hitherto our experience has been that when any one of these chiefs has been subdued by us, the greater part of his people settle down quietly under our rule; but until each one has been separately dealt with, he remains our enemy. One of the most difficult matters which had to be dealt with as trade increased in the Shire highlands, was to put an end to highway robbery carried on by Yaos. These people, in bands of fifteen or twenty, armed with guns, would lie in wait on any of our main roads, and would attack the first band of unarmed porters passing with merchandise. Many hundred pounds' worth of goods have thus been stolen, and a number of lives lost. The detection of the actual culprits in such cases is practically an impossibility, though we are able to find from what districts or towns they come. I am glad to say, however, that, owing to the worst offending chiefs having been summarily dealt with, our principal roads have now become almost free from attempts of this kind.

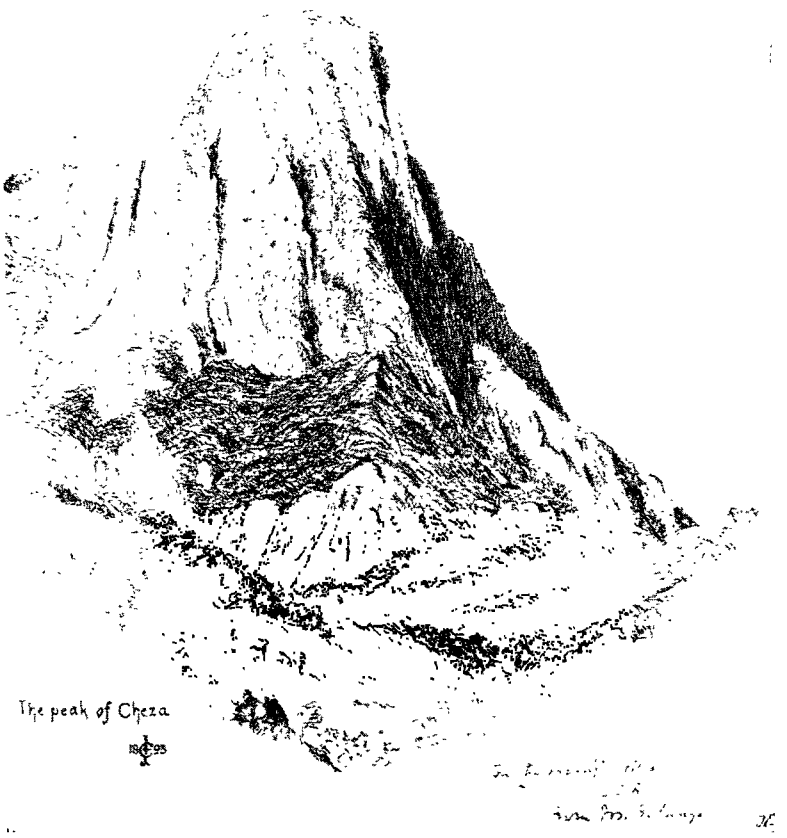
Apart from African natives, European settlement in Central Africa is, of course, distasteful to the Arabs. In such parts as we are too strong for them, they may settle down for a time under our rule, or else remove to more remote districts; but a very difficult question in tropical African colonization will always be—*what to do with the Arab.* His mode of life, his ideas, and all his instincts and interests are opposed to ours; and it will probably need sufficient time for a new generation of the African Arab to have arisen before we cease to have difficulties and troubles with him.

The people inhabiting the countries of Ulungu and Itawa use the word "Tanganyika" as implying a large piece of water, just as the word "Nyanja," or "Nyasa," or "Nyanza," is used in other parts of Africa. The word "Mweru," again, is used by the Lunda people as simply meaning the same, and does not of necessity apply to any special lake. In Itawa the lake which we call Mweru was frequently spoken of to me as Tanganyika. On the upper Luapula, Bangweolo was called Mweru, Mwelu, or Mwelo, *i.e.* simply "the lake." I found no natives who knew the word "Bangweolo." As I have previously suggested in this Society's *Journal*, I think that the expression used to Dr. Livingstone would probably be Pa Mwelo, *i.e.* "At the lake." If these two words are pronounced quickly, it will be seen that there is a great resemblance to "Ba-Ngĕolo," as a native would pronounce it.

Up to the present day there has been practically no prospecting for minerals in B.C.A. Any of those who casually looked about for signs of gold have been without special knowledge. Iron, of course, exists almost everywhere; probably no country is richer in iron than this

portion of tropical Africa; but, needless to say, iron has no commercial value in such a country and so far from the coast. During 1894 extensive beds of coal were found, not far from the navigable portion of the Shire river, and it is quite possible that at a future date this coal-field may turn out to have a commercial value.

The question of a possible colonization of some portions of the high-



THE PEAK OF CHEZA, IN THE MLANJI HILLS.

lying plateaux of tropical Africa has been of late much discussed. At the Geographical Congress held in London in July last, a very interesting paper was read on this subject by Sir John Kirk, and various views were expressed in the discussion which followed, but not much mention was made of the only successful agricultural settlement which at present exists within tropical Africa north of the Zambezi—I mean the Shire highlands. Yet the results and experience gained in that district

afford us almost the only really reliable data on which we can go. It is, I think, doubtful if Europeans will ever be able to form permanent colonies in Central Africa of the same description as we have in New Zealand, Australia, and South Africa. Colonies, I mean, to which emigrants could go, and which would form an outlet for the surplus population of European countries. It is absolutely essential for the establishment of such colonies that families can be reared in good health, without having to be periodically sent out of the country to lower latitudes It would, of course, be rash to say that such colonization is *absolutely* impossible in any portion of tropical Africa north of the Zambezi, but such experience as we have at present goes to show that we cannot expect it. In the Shire highlands, I think we have as good a climate as will be found in any of the elevated plateaux of Central Africa, and what has been found there is, that no matter what height Europeans go to, they are still subject to periodical attacks of fever. Intermittent fever does no great harm, and to some extent one becomes inured to it. Remittent fever, however, is a far more troublesome type, and the worst of all is hæmaturic or black water fever, which seems to make its appearance sooner or later in any part of Central Africa where Europeans settle.

The Shire highlands have shown quite clearly, however, that, given certain conditions, we can form successful colonies of a certain type in tropical Africa, more like those we have founded in such countries as Ceylon, Burma, etc.; and the more knowledge we get of tropical Africa, the more convinced we cannot fail to become that enormous districts are bound to be eventually, in one way or another, exploited, settled, or colonized. It matters little, I think, what particular word we use; things will shape themselves—as they have done in the Shire highlands. Cheap and easy communication and transport are, of course, the first great and absolute essentials, without which we can do little or nothing.

B.C.A. is in itself a rich country, both in minerals and for agricultural purposes. Indeed, when tropical Africa is compared with India, the former, so far as the country itself is concerned, is the richer one; but its poverty lies in the fact that it has no indigenous industrious race, while the wealth of India is created by its inhabitants. The African, in his uncivilized condition, not only produces next to nothing, but has little ambition to acquire wealth, nor has he many wants. This, no doubt, is largely due to the fact that for centuries past he has never known what it is to have permanent peace. If he could be imbued with a spirit of industry and a desire to accumulate wealth, such as the Indian has, tropical Africa would soon become one of the richest countries of the world.

Much has been done within the last few years to put an end to the slave trade in the Nyasa districts. This, of course, as every one knows,

is one of the most difficult questions which is encountered in Africa. It is sometimes thought at home (though perhaps less so now than formerly) that it is only the Arab who makes slaves, and that all Africans are merely sufferers in this respect, who would be only too glad to put an end to slavery for ever. This is not a correct view, and, as a matter of fact, the African is not by any means free from blame in the matter. Slavery is one of the great institutions of Africa, and if no Arab were to enter the continent from to-day henceforth, there would



FALLS OF THE RUO.

still be many slave raids, and thousands of slaves. Among the worst offenders in this respect are those tribes who visit the coast from time to time for trading purposes. Compared with the frightful cruelties of a slave export trade, domestic slavery in Africa cannot be looked on as a very great evil. In either case the slaves are procured for the greater part by raids, but the subsequent lot of the domestic slave is not a hard one. It will be a long time before domestic slavery can be done away with in any Central African possessions; but when, in any

one of them, we can say that we have succeeded in totally abolishing the export of slaves, we shall have much to congratulate ourselves on. All systematic transport of slaves across Lake Nyasa has now been done away with. Formerly, no doubt, large quantities were crossed from the west to the east side, some in dhows, a few in large canoes, at one or two of the narrowest places. The first blow to this transport was the placing of gunboats on the lake. Subsequently stations were formed at the principal crossing-places; and finally, all the dhows used in the traffic have been taken over by the Administration, which now works regular ferries from Government stations. By this means every



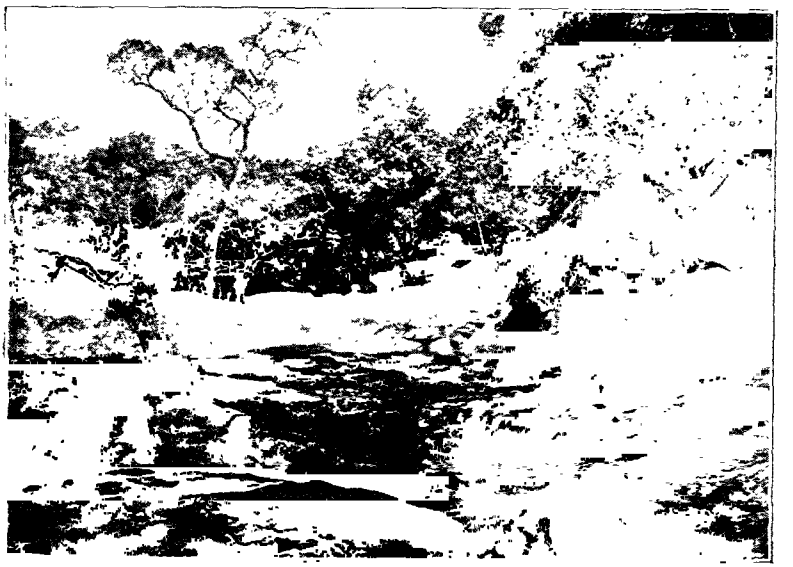
NATIVE WOMAN ON ZOMBA SLOPES.

facility is given to caravans or to natives, whose objects are not illegal, to cross from one shore of the lake to the other; but all attempts at slave transport are put a stop to.

B.C.A. offers a field at the present time to planters with limited capital, provided that they are willing to work hard themselves, to dispense with any highly paid assistance, and to put up with a life which offers very little in the way of recreation, and next to no society. The lot of a coffee-planter in the Shire highlands, however, is becoming a somewhat pleasanter and easier one than it was a few years ago. Most of the plantations as yet opened are within reasonable distances of Blantyre, which has thus become a commercial and social centre. This township has a number of excellent stores, where almost all goods in demand in the country can be procured at from fifty to

eighty per cent. above home prices. We now have there a club, hospital, literary society, planters' association, bank, shooting-club, post office, telegraph office, hotel, and various other institutions; and, the roads having been greatly improved, it is no longer difficult for settlers to visit one another, and to meet in Blantyre. Horses, if brought quickly from the coast to the highlands, and well cared for on the journey, do well when once in the hills; several foals have been born in the country.

The climate is not a hot one. There are, throughout the country, two levels—the one, the low level, being the line of the Nyasa "trough,"



STREAM AT FORT LISTER, MLANJE.

together with the Shire valley; the other, the high level, being actually the general altitude of this part of Africa. Immediately on leaving the Shire valley, or Lake Nyasa, one mounts to an altitude of from 3000 to 5000 feet (or more in some parts). The climate of the high levels is almost a European one, in which, for a great part of the year, the same clothes can be worn as would be used during an English summer. Nyasa and the Shire form, in fact, a *rent* through high lands. As soon as the low strip of country near the shores of the lake is crossed, steep wooded hills are climbed, until, at about 4000 feet, more open country is reached, with wooded gullies and large stretches of grass-covered "feldt." Streams of clear cold water run down every little valley, and cool breezes always blow. Much of this high country is admirably suited for settlement by Europeans—for "permanent colonization," in fact, if only there could be found some preventative of the

various forms of malaria. As I have already stated, these complaints prohibit permanent residence in the country as far as we are yet able to judge; but except on this question of *health*, there is nothing to prevent permanent European colonization. The climate is pleasant, and necessaries of life are plentiful and cheap. It is a country which, except for fever, would thoroughly suit South African Boers or people with similar tastes. In the high parts of B.C.A. cattle and horses thrive, and there is no tsetse fly. Our trade is, of course, at present a small one, but it is steadily increasing. The natives are developing new wants, and if trade were to go from them they would find it very hard to get back to their old condition.



MLANJE POST-OFFICE.

The Protectorate is badly in want of a railway from Chiromo to Blantyre, some 60 miles long only. Such a line would pass through the rich coffee-planting district of Cholo, and could conveniently be extended from Blantyre northwards to the navigable portion of the upper Shire, so connecting the lower with the upper Shire river, and completing a line of steam communication which would reach from Chinde to the north end of Nyasa, a distance of some 700 miles. There would be no great difficulties about the construction of this railway, which might be a light narrow-gauge line, say 2 feet 6 inches.* The capital required would probably not exceed £200,000 as far as Blantyre. The up-keep would not be high, and even at the present date there is an existing incoming freight at the rate of about 3000 tons per annum,

* A survey has already been made.

which now costs, from Chiromo to Blantyre, some £5 per ton. There is an increasing outgoing freight, and passenger traffic both ways. I think it is probable that such a line would pay a dividend from the very commencement if economically worked. In addition to this, there is the certainty that such a line would greatly stimulate trade and all undertakings in B.C.A.

In speaking of the resources of the country, I feel that this question has been so fully dealt with previously by Sir H. H. Johnston, and also by Captain Lugard and others, that there really remains little for me to say.

I have only hitherto spoken of *coffee* as the present staple industry, because that is the product which has proved itself to be a financial success. One so frequently reads of this, that, and the other part of Central Africa, that it is a "mine of agricultural wealth;" that it *could* be made to grow wheat, coffee, tea, or a score of other things; but when one asks what it already *has* done, the answer frequently is, "Nothing." In the Shire highlands, the question of coffee-planting has been *settled* by some fifteen years of steady hard work, without advertisement. Many other things, such as tea, cacao, tobacco, wheat, etc., are being tried. With regard to wheat, it is probable that all the flour required in the country will, before long, be locally grown. Already the settlers and missions in the South Tanganyika districts grow their own wheat and make their own flour. A field of some 10 acres at Blantyre, somewhat carelessly and sparely sown and cultivated, last year produced over fifteen bushels to the acre, at a very low cost. Whether wheat can ever be exported at a profit will depend on railway construction chiefly; but so long as there are other products, such as coffee, which give larger profits, settlers are not likely to turn their attention to wheat. The firm of Buchanan Bros., who have done so much for the development of the Shire highlands, export tobacco of a fair quality, and are of opinion that there is a considerable future for this industry. They have recently imported skilled growers and curers, as well as cigar-makers, from India, and are outlaying a considerable capital in the undertaking.

Rubber exists in fair quantities throughout the country, but has been little collected as yet; and this is an industry which might well be largely increased. In addition to the ordinary vine or creeper from which the usual East African rubber is collected, there are at the north end of Nyasa, in the Nkonde country, great quantities of trees—a description of ficus, I believe—yielding excellent rubber. In the lake regions, however, up to the present, few endeavours have been made to obtain rubber, or any other article for export; ivory having been the main thing sought for. Ivory is now becoming scarce in B.C.A., and the trade will before long die out. What at present comes is brought from the Tanganyika districts.

No review, however brief, of the trade in B.C.A. would be complete without reference to the excellent work which has been done there by Mr. L. M. Fotheringham, who was for some years the manager of the African Lakes Corporation, and whose lamented death took place a few months ago. There has never been a more honest, clear-headed, and enterprising man in the country. He has been the *practical business man*, who has been foremost in all schemes for advance and improvement; and one and all, planters, missionaries, explorers, traders, and the Administration, have much to thank him for.

As yet the Shire highland planters have, practically, all their eggs in one basket; and it will doubtless continue to be so for some time to come, as new settlers naturally go in for what they already know will pay, in preference to unproved things. There are enterprising planters in the country, however, who are trying and experimenting with all such tropical or semi-tropical products as give a prospect of success.

Land can be purchased from European owners, from the Government, or through the Government from natives. Its value in the Shire highlands, in the neighbourhood of Blantyre, has risen considerably during the past year, but is still cheap. In more remote districts land can be purchased for trifling amounts, provided that purchasers will improve their holdings.

It was at first found difficult in B.C.A., in some instances, to instil into natives the idea of individual ownership of land. Although they might have sold clearly defined blocks of unoccupied country to Europeans, they would from time to time encroach upon these, pick out the best bits, and come in and fell the bush preparatory to planting their own crops on it. This gave rise to disputes.

In the Shire highlands now, however, the natives fully understand this question of defined boundaries and private ownership—so much so, that of late several Blantyre natives have purchased blocks of land from the Government, and are opening coffee plantations upon them.

I believe firmly that we may look for great development in this direction. Natives are quick to follow a lead when they see it brings them profit. And although we cannot expect that Africans who have had little intercourse with Europeans will quickly settle down to quiet, regular occupations, it is a different matter in districts like the Shire highlands, where for years past they have watched Europeans at work, and have begun to understand the idea of laying out work for a future large return. I know that many believe the African incapable of this. I thought so myself at one time; but it must be remembered that at Blantyre there is a generation growing up who have known the white man from their earliest youth—who do not look on him as anything new, but as part of their world. Blantyre is a centre from which much good of this description may spread.

I may say a word on the question of the raising of revenues

in Central African colonies or protectorates, by native taxation. It is, of course, essential that the native should contribute to the cost of administration of his own country, and the question is as to what form of taxation is most suitable to the circumstances. In B.C.A. a hut tax has been found to be easily understood by the natives, and to be, all considered, the most satisfactory and easily worked system. In the first instance the tax was collected in *kind*; after a time, however, it was found that in more advanced districts, such as Blantyre and Zomba, the people infinitely preferred to pay in *cash*. The matter was therefore made entirely optional; and the result has been that practically the whole of the Blantyre district, lower Shire district, and large portions of other districts, now pay their taxes in cash. This undoubtedly suits the B.C.A. native better than a tax in kind only, and enables him to realize a better price for his products, sold in his own way, than can be obtained by the Administration when forced to dispose of large quantities of native produce. It has also encouraged him to work for and hoard up money. Quite a number of Blantyre natives now have accounts at the local bank, and, having once grasped the idea that they can purchase future benefits by accumulating present savings, have taken one of the first steps towards permanent civilization. The African is not a fool in such matters; he is able to look after his own interests, and is not so easily imposed on as is sometimes supposed.

NOTES ON ANCIENT AND MEDIÆVAL MAKRAN.*

By Colonel T. H. HOLDICH, C.B., C.I.E., R.E.

ONE of the latest districts traversed and surveyed by the Indian frontier surveyors is Makran. It is possible that some amongst even good geographers may not be precisely acquainted with the geographical position and extent of this long-forgotten country. Makran extends along the northern shores of the Arabian Sea between Karachi and the Persian Gulf, commencing from the Sonmiani bay on the east, and terminating somewhat indefinitely on the west within the recognized territory of Persia. Makran is a geographical rather than a political territorial designation, and may be called the most southern district of South-Western Baluchistan. The limit of British influence on the one side, and Persian on the other, is defined by a demarcated boundary between the Dasht and Sarbaz rivers; but the western limits of Baluchistan on the Arabian sea-coast are not so definite, the Baluch language being spoken as far west as Cape Jask, where the Persian coast first commences to trend northward towards the gulf. The telegraph station of Jask forms the link between the overland line of the Persian Gulf telegraph system and the submarine cable, which

* Map, p. 452.

commences here, and connects the land line with Bushire and Basra on the Euphrates. Between the eastern borders of Makran and Karachi, there intervene the more or less open plains of the Lus Bela district. Lus Bela is already well known to many British residents in Western India. Lately it has been associated in the minds of many with the death of Sir Robert Sandeman. His last resting-place is at Lus Bela, and the garden which surrounds his grave is the brightest spot in a land which is much wanting in the charms of landscape.

Makran does not extend far inland. Its width is from about 80 to 100 miles, including the long, straight valley of Kej, which, in mediæval geography, has its name associated with that of Makran, under the compound designation Kej-Makran. The name Makran I believe to be derived from two Persian words, viz. Mahi (fish), and Khuran (to eat). So simple a derivation is, I am aware, a stumbling-block to some etymologists, but it is too appropriate to be parted with without a struggle. The whole population of the Makran coast lives on fish to an extent that may seem almost incredible. Not only do men, women, and children eat fish, but fish enters largely into the food of dogs, cats, camels, and cattle. By fish the people live. Fish are dried, salted, and exported to the west coast of India, where salt duties prevent a local industry, and to China, whilst large quantities are sent inland. The coast-line for miles is soaked in an atmosphere of dead fish, and the very huts of fishermen are occasionally built up with whales' bones. The Makrains of the coast are the veritable Ichthyophagi of the Greeks, and the stories told of their fish-eating propensities by Arrian are true of them still.

The ethnographical conditions of southern Baluchistan are about as complicated as any in Asia. The original stock of the country underlying all else is Tajak or Persian, and it has been so, at any rate, since the days of Darius. The Baluch language is an archaic form of Persian, said to be the language that the poet Firdusi talked. Traces of ancient forms of fire-worship are not wanting, especially along the coast, where the classical Parsirees or Parsidai (possibly the ancient representative of the modern Parsi) have left indications of their former existence at Pasni and, more conspicuously, in the neighbourhood of Gwattar bay. Off the coast of Makran is an island, once sacred to the sun, and still surrounded with an atmosphere of myth and fable, called Hashtola, or sometimes Haftalu. It is also locally known as Serandip, which orientalists will recognize as an old name for Ceylon. In this island of Hashtola, or Astola, we can recognize the Asthara of Ptolemy and the Nusala of Arrian. Here dwelt the Nereid who turned men into fish, and it was off this island that Nearkos lost one of his galleys in a storm. More recently it has served as a base for piratic operations on the part of Meds and Karaks in the Arabian Sea. A yet older cult than that of fire-worship is also to be traced through this part of Southern

Baluchistan, if we are to accept Professor Rawlinson's derivation of the name Baluchistan from Belus, or Baal; but this derivation, I am aware, is at least open to question. It can hardly be doubted, however, that Baal-worshippers passed through Makran, if they did not actually occupy the whole country in those days, when the pre-Semitic Dravidian races of Mesopotamia were gradually displaced by the Semite in the plains of Chaldæa. It seems most probable that these Dravidian races which now occupy the jungles and mountains of the Central Provinces of India, and who left representatives of their mighty family in the hills of Makran as they passed, must have migrated from the neighbourhood of Babylon to India. They have left their silent records in the shape of curious little stone-built structures on the Makran hillsides, which occur in groups or towns, and give the name Damba Koh to the hills they occupy.

These curious ruins are wrapped in the same traditions as may be recognized again amongst modern Turanian tribes in Central and Southern India to this day. Here, too, Colonel Mockler (who was long resident on the Makran coast) discovered traces of that peculiar form of sepulture which, so far as I know, has hitherto been found only in Chaldæa, *i.e.* the burial of the dead in earthenware pots. This, indeed, appears to be the oldest form of sepulture known in Mesopotamia. Dravidian races still exist in Makran under the name Brahui, or Barohi (*i.e.* mountaineer), and they occupy nearly all the hilly districts of the eastern part of the country. They appear to be exactly where they were when they met Alexander's army in its retreat from India, and can be recognized as the Sakæ, Sagitti, Parkanoi of classics. all of which names are to be found either as tribal or local designations at the present time. There was possibly a period in prehistoric days when all Makran was peopled with this Turanian or Dravidian race. We find mention made by Ptolemy of a people called the Rhamnai who dwelt on the extreme east near the banks of the Purali, and who planted their capital at a place called Rhambakia. Rhambakia is mentioned by Alexander's historian as the capital of a people called the Oritæ. The Rhamnai are said to have wandered south-east, and in Ptolemy's time were settled in the Vindhya mountains; but who were the Oritæ? I thought, when I first visited the Bela district, that they might possibly have been the modern Rajput occupants; but the Rajput immigration from the east is comparatively recent, and must have occurred since Lus Bela was a Budhist kingdom, which we know to have been about the time of the Mahomedan conquest of Sind; so that it is probable that the Oritæ were Dravidians (they are described as non-Indian by Arrian), cognate to the present Brahui tribes, and that remnants of the tribe are still to be found further west. Thus we can as clearly trace a Dravidian phase in the ethnographical history of Makran as we can in India, and, as in India, it has lasted in fragments until now. So intermixed and so extensive are the various

groupings of this ethnographical history that it is impossible to separate them clearly and distinctly. Earliest of all may have been that apparently aboriginal occupant of the coast whom Nearkos describes in his graphic account of the stirring little fight which took place near the mouth of the Hingol river (then called Toméros), when the Greeks leapt into the sea to meet their adversaries. The savages whom they encountered are described as fish-eaters, clothed in fish-skins—a hairy race, with long nails with which they used to divide their fish; and they used for weapons wooden pikes hardened in the fire. Such a description might appear almost apocryphal but that a specimen of the race has been caught in the forests of Central India within living memory, and he did not differ largely from Arrian's description of the barbarians of Makran.

Next, perhaps, amongst the rolling centuries of that prehistoric time, we might have found that race known in Southern India in the present day as the Pandomanagai, or race of little men, dwarfs, or pigmies, frequently alluded to by classical writers in other parts of India, traces of whom are found all along the western coast of India, and are not altogether wanting, even if they are faint, in the cave-dwellings of Makran. Then came successive waves of Dravidian, followed by Aryan, immigration, and we begin to feel the solid ground of history. Herodotus describes Makran, including it in one of the Persian satrapies, and he enumerates the tribes of Gadrosia (the ancient Greek name for Makran) under names which are mostly recognizable still. The only people, indeed, distinctly classed by Herodotus whom we fail to find are those whom he calls Asiatic Ethiopians, those descendants of Kush whom some authorities still believe to have left evidence of their existence in the nomenclature of the country. The name Kej, and synonymous terms variously written by Arab geographers, are referred back to the eponymous Kush, and the association of the names Kej-Makran, which has been common under various forms through all ages, has been accepted as pointing to the fact that Ethiopian tribes once occupied Southern Baluchistan. Woolly-headed negroes, slaves and descendants of slaves imported from Africa, are common enough, but no Kushites, so far as I know; and I think it possible that Herodotus referred to the Dravidian inhabitants of the country under this term. I am more inclined to accept the prefix Kej, or, as it is more generally written by the Arabs, Kiz, as a generic term referring to comparatively open and flat country—such as the Kej valley in Makran, or the more open plain of Gandava, generally known as Kach-Gandava. The Kiz Kaián, so frequently mentioned in mediæval geography, and never hitherto located by orientalists, were the plains north-west of Makran stretching towards the frontier of Kirman. The word Kach, Kachi, or Katz is frequently met with in Western India, and always denotes a flat country, even if it be only a flat space at the foot of precipitous mountains.

Very much indeed still remains to be investigated about those early prehistoric waves of migration that passed through Makran to India. Fergusson has said that "across the Indus nation after nation have poured their myriads into the coveted domain of India, but no reflex wave has ever mixed her people with those beyond her boundaries." Exceptions to this rule are to be found in Makran. These Rajput races which now dominate Lus Bela, and have established their authority in the Kej valley of Makran, certainly migrated westwards; and there are also the Meds, those fish-eating villagers of the coast, once the most dreaded pirates of the Eastern seas, who have undoubtedly held a dominant position in the northern valley of the Indus, and who have been gradually pushed from the north-west to the Indus delta, and thence thrust over the Indus to Makran. If Arrian is correct in crediting the Medes as well as the Assyrians with the conquest of Northern India, we may have the remnants of those conquerors in the Med fishermen of the Arabian sea-coast.

We must, however, turn from prehistoric phases of Makran ethnography to those later arrivals whom we find implanted amongst the old Persian Dravidian stock at the present day. Throughout the hill districts of the Sind border, extending westwards through Makran, we find scattered a great confederation of powerful tribes known as Rind. The Rind, whether he hails from a mountain glen near Quetta, or from the extreme west of Makran, always poses as the true Baluch. The Rinds are the aristocracy of Baluchistan, even where the Rajput dominates; and if you ask a member of any tribe of that widespread confederacy from whence his people originally came, he invariably replies from Haleb, or Aleppo. The Rind is most probably the modern representative of that Arab irruption into India which accompanied or succeeded its invasion by Mahomed Kasim in the year 712 of our era. Undeterred by the traditional discomfiture of Semiramis, queen of the Assyrians, or of Cyrus, in the deserts of Makran (traditions which, indeed, served but to inflame the ambition of Alexander, who fared but little better than his illustrious predecessors), Hajjaj, the governor of Irak, under the Kalif Walid I., projected three simultaneous expeditions into Asia for the advancement of the true faith. One was directed towards Samarkand, one against the King of Kabul, and the third was to operate directly on India through the heart of Makran. The Makran field force was organized in the first instance for the purpose of punishing certain Karak and Med pirates who had plundered a valuable convoy sent by the ruler of Ceylon to Hajjaj and to the Kalif. These Karaks probably gave their names to the Krokala of Nearkos, and the Karachi of to-day, and have disappeared. The Meds, as I have already explained, still exist. The expedition, which was placed under the command of an enterprising young general aged seventeen, named Mahomed Kasim, not only swept through Makran

easily and successfully, but ended by establishing Mahomedan supremacy in the Indus valley, and originated a form of government which, under various phases, lasted till Mahmud of Ghazni put an end to a degenerated form of it by ousting the Karmatian rulers of Multan in 1005. The original force which invaded Sind under Mahomed Kasim, and which was drawn chiefly from Syria and Irak, consisted of 6000 camel-riders and 3000 infantry. In Makran the Arab governor (it is important to note that there was an Arab governor of Makran before that country became the high-road to India) added further reinforcements, and there was also a naval squadron, which conveyed catapults and ammunition by sea to the Indus valley port of Debal. It was with this small force that one of the most surprising invasions of India ever attempted was successfully carried through Makran—a country hitherto deemed impracticable, and associated in previous history with nothing but tales of disaster. Ere long, however, we find that Mahomed Kasim had both the piratical Meds, and the hardly less tractable Jats (a Skythic people still existing in the Indus valley, not unconnected with the Gitanos, or gypsies) in his train, and the news of his successes carried to Damascus brought crowds of Arab adventurers to follow his fortunes. When he left Multan for the north, he is said to have had 50,000 men under his command. His subsequent career and tragic end are all matters of history. The points chiefly to note in this remarkable invasion are that the Arab soldiers first engaged were chiefly recruited from Syria; that, contrary to their usual custom, they brought none of their women with them; and that none of them probably ever returned to their country again. Elliott tells us of the message sent them by the savage Kalif Sulaiman, "Sow and sweat, for none of you will ever see Syria again." What, then, became of all these first Arab conquerors of Western India? Is there any trace of them now? The reply to this question seems to me to be that their descendants exist in that formidable band of frontier tribes known as Rind, every man of whom says his ancestors came from Syria, whilst he bears about him the unmistakable stamp of Semitic origin. Put a Rind of Western Makran and a Bedu of Eastern Arabia together, and they might well be brothers so far as personal appearance goes. They must have taken Persian-speaking wives of the stock of Makran and Baluchistan, and their children, speaking their mother-tongue, probably lost all knowledge of their fathers' language in the course of a few generations. There are many such instances of the rapid disappearance of a language in the East. These people, the Rinds of to-day, are the latest arrivals in this strange meeting-place of the nations, if we except the Rajput irruption of Lumri and Gichki tribes from the East, which is indeed almost modern history. For three centuries, then, whilst a people of Arab descent ruled in Sind, there existed through Makran one of the great highways of the world, a link

between West and East such as has never existed elsewhere on the Indian border, save perhaps through the valley of the Kabul river and its affluents. Along this highway flowed the greater part of the mighty trade of India, a trade which has never failed to give commercial predominance to that country which held the golden key to it, whether that key has been in the hands of Arab, Turk, Venetian, Portuguese, or Englishman. And though there are traces of a rapid decline in the mediæval prosperity of Makran after the commencement of the eleventh century, yet its comparative remoteness in geographical position saved it subsequently from the ruthless destruction inflicted by Turk and Tartar in more accessible regions, and left to it cities worth despoiling even in the days of Portuguese supremacy.

It is only lately that Makran has lapsed again into a mere geographical expression. Ten years ago our maps told us nothing about it. It might have been, and was for all practical purposes, as unexplored and unknown as the forests of Africa. Now, however, we have found that Makran is a country of great topographical interest as well as of stirring history. We can not only find the peoples written of by Herodotus, but we can trace the slow course of the galleys and transports of Nearchus along the coast, noting meanwhile the curious changes that time has wrought in the coast configuration. We can point out the strange route followed by Alexander, and wonder what manner of madness could have induced him to select such a route. We can find the ports at which Arab ships, the dhows and buglas which were the first of all East Indiamen (if we except the Chinese junk), used to touch and collect their store of myrrh, bdellium, and spikenard, in exchange for those many and strange kinds of merchandise which you may find enumerated in the Periplus of the Erythræan Sea; some relics of which, indeed (such as the γαλος ὰρθη, the Egyptian glass), you may dig up on almost any site between Karachi and Babylon. And when we come to the days of Arab ascendency, when Arab merchants settled in the country; when good roads with well-marked stages were established; when, fortunately for geography, certain western globe-trotters following, *longo intervallo*, the example of the Chinese pilgrims—men such as Ibn Haukal of Baghdad, or Istakhri of Persepolis, first set to work to reduce geographical discovery to systematic compilation, we can take their books and maps in our hands, and verify their statements as we read. It is true that they copied a good deal from each other, and that their manner of writing geographical names was obscure, and leaves a good deal to be desired—a fault, by the way, from which the maps of to-day are not entirely free—yet they are on the whole as much more accurate than the early Greek geographers as the area of their observations is more restricted. We may say that Makran and Sind are perhaps more fully treated of by Arab geographers than any other portion of the globe by the geographers who preceded them; and as

their details are more perfect, so for the most part is the identification of those details rendered comparatively easy by the nature of the country and its physical characteristics. With the exception of the coast-line, the topography of Makran to-day is the topography of Makran in Alexandrian days. This is very different indeed from the uncertain character of the Indus valley mediæval geography. There the extraordinary hydrographical changes that have taken place; the shifting of the great river itself from east to west, dependent on certain recognized natural laws; the drying up and total disappearance of ancient channels and river-beds; the formation of a delta, and the ever-varying alterations in the coast-line, due possibly to monsoon influences, leave large tracts almost unrecognizable as described in mediæval literature. Makran is, for the most part, a country of hills. Its valleys are narrow and sharply defined; its mountains only passable at certain well-known points, which must have been as definite before the Christian era as they are to-day; and it is consequently comparatively easy to follow up a clue to any main route passing through that country.

Along our western frontier of India, south of Jacobabad, the general direction of the Indus channel is not a bad index to the general trend of the mountain ranges west of it. They lie packed in parallel ridges, rising in altitude from the plains of the Indus to the plateau of Baluchistan, and the eastern section of the present system abuts on the sea between Karachi and Sonmiani bay. Westward of Sonmiani, it is the coast-line which roughly indicates the general trend of the remaining or western half of the system. The same curiously close parallelism of narrow ranges running east and west is traceable past the western limits of Makran into the Bashkurd country beyond. Here it becomes more irregular. The westward curve of this inner band of ridges, from a direction nearly north and south parallel to the Indus, to one nearly east and west parallel to the coast of Makran, leaves a triangular space of comparatively open country between itself and that eastern section which abuts on the sea between Karachi and Sonmiani. Down this open space descends the Purali river (the ancient Arabius), which is itself gradually shifting westward, and which finds its way into the sea through a large tract of low-lying country which was a shallow sea at no very distant date. Hereabouts was the land from which bdellium was exported: and here, on the right bank of the Purali, was the ancient Dravidian capital of Rhambakia.

It follows, from this configuration, that Makran is a country full of long narrow valleys running east and west, the longest and most important being the valley of Kej. The main drainage of the country reaches the sea by a series of main channels running south, which, inasmuch as they are driven almost at right angles across the general run of the watersheds, necessarily pass through a series of gorges of most magnificent proportions, which are far more impressive as spectacles

than they are convenient for practical road-making. Makran is, in fact, very much easier to traverse from east to west than it is from north to south. At certain points along the coast the mountain system touches the sea, and the right of way becomes blocked by a magnificent mass of impassable rock-bound barrier, which terminates in huge square-headed bluffs to seaward. Such is Ras Malan, the ancient Malana, which effectually barred the march of the Greek army in its progress along the coast westward.

I have, perhaps, said enough to indicate that the old highways through Makran, however much they may have assisted trade and traffic between east and west, could only have been confined to very narrow limits indeed. It is, in fact, almost a one-road country. Given the key, then, to open the gates of such channels of communication as exist, there is no difficulty in following them up, and the identification of successive stages becomes merely a matter of local search. We know where the old Arab cities *must* have been, and we have but to look about to find their ruins. The best key, perhaps, to this mediæval system is to be found in a map given by the Baghdad traveller, Ibn Haukal, who wrote his account of Makran early in the tenth century, and though this map leaves much to be desired in clearness and accuracy, it is quite sufficient to give us the clue we require at first starting. In the written geographical accounts of the country, we labour under the disadvantage of possessing no comparative standard of distance. The Arab of mediæval days described the distance to be traversed between one point and another much as the Bedouin describes it now. It is so many days' journey. Occasionally, indeed, we find a compiler of more than usual precision modifying his description of a stage as a long day's journey, or a short one. But such instances are rare, and a day's journey appears to be literally just so much as could conveniently be included in a day's work, with due regard to the character of the route traversed. Across an open desert a day's journey may be as much as 80 miles. Between the cities of a well-populated district it may be much less. Taking an average from all known distances, it is between 40 and 50 miles. Nor is it always explained whether the day's journey is by land or sea, the unit "a day's journey" being the distance traversed independent of the means of transit.

In Ibn Haukal's map, although we have very little indication of comparative distance, we have a rough idea of bearings, and the invaluable datum of a fixed starting-point that can be identified beyond doubt. The great Arab port on the Makran coast, sometimes even called the capital of Makran, was Tiz; and Tiz is a well-known coast village to this day. About 100 miles west of the port of Gwadur there is a convenient and sheltered harbour for coast shipping, and on the shores of it a telegraph station of the Persian Gulf line, called Charbar. The telegraph station occupies the extremity of the eastern horn of the

bay, and is separated inland by some few miles of sandy waste from a low band of coarse conglomerate hills, which conceal amongst them a narrow valley, containing all that is left of the ancient port of Tiz. If you take a boat from Charbar point, and, coasting up the bay, land at the mouth of this valley, you will first of all be confronted by a picturesque little Persian fort perched on the rocks on either hand, and absolutely blocking the entrance to the valley. This fort was built, or at least renewed, in the days of General Sir F. Goldsmid's Sistan mission, to emphasize the fact that the Persian Government claimed that valley for its own. About a mile above the fort there exists a squalid little fishing village, the inhabitants of which spend their spare moments (and they have many of them) in making those palm mats which enter so largely into the house architecture of the coast villages, as they sit beneath the shade of one or two remarkably fine "banian" trees. The valley is narrow and close, and the ruins of Tiz, extending on both sides the village, are packed close together in enormous heaps of *débris*, so covered with broken pottery as to suggest the idea that the inhabitants of old Tiz must have once devoted themselves entirely to the production of ceramic art ware. Every heavy shower of rain washes out fragments of new curiosities in glass and china. Here may be found large quantities of an antique form of glass, the secret of the manufacture of which has (according to Venetian experts) long passed away, only to be lately rediscovered. It takes the shape of bangles chiefly, and in this form may be dug up in the sites of almost any recognized site of ancient coast towns along the Makran and Persian coasts. It is undoubtedly of Egyptian origin, and was brought to the coast in Arab ships. Here also is to be found much of a special class of pottery, of very fine texture, and usually finished with a light sage-green glaze, which appears to me to be peculiarly Arabic, but of which I have yet to learn the full history. It is well known in Afghanistan, where it is said to possess the property of detecting poison by cracking under it, but even there it is no modern importation. Doubtless it is known to experts, but I have not yet discovered a name for it. The rocky cliffs on either side the valley are honeycombed with Mahomedan tombs, and the face of every flat-spaced eminence is scarred with them. A hundred generations of Moslems are buried there. The rocky declivities which hedge in this remarkable site may give some clue to the yet more ancient name of Talara which this place once bore. Talar in Baluchi bears the signification of a rocky band of cliffs or hills.

The obvious reason why the port of Tiz was chosen for the point of debarkation for India is that, in addition to the general convenience of the harbour, the monsoon winds do not affect the coast so far west. At seasons when the Indus delta and the port of Debal were rendered unapproachable, Tiz was an easy port to gain. There must have been a considerable local trade, too, between the coast and the highly

cultivated, if restricted, valleys of Northern Makran, and it is more than probable that Tiz was the port for the commerce of Sistan. Sistan (the ancient Drangia) and the lower Helmund valley were, in mediæval days, most richly cultivated districts, with an enormous area of irrigated land, and boasting the possession of cities the magnitude of which we can but faintly estimate from the extent of their widespread ruins. From Rudbar on the Helmund, westward, the valley is but a vista of dead cities for mile upon mile. In Sistan we are but beginning to trace their records. I know of the graveyard of one dead city at least, where 8 or 10 straight miles of ruins may be counted, and where brick-built two or three storeyed houses still stand in silent witness to the strength of Arab architecture. Sistan was the granary of Asia once; it might be so again, were the magnificent irrigation schemes of the past revived. From Sistan a very large export trade (now represented by some few dozen Kafilas a year) must once have poured southwards, and Tiz was in all probability the coast outlet for it.

From Tiz to Kiz (or Kej, which is reckoned as the first big city on the road to India in mediæval geography) was, according to Istakhri and Idrisi, a five days' journey. Kiz is doubtless synonymous with Kej, but the long straight valley of that name which leads eastwards towards India has no town now which exactly corresponds to the name of the valley. The distance between Tiz and the Kej district is from 160 to 170 miles. No actual ruined site can be pointed out as yet marking the position of Kiz, or (as Idrisi writes it) Kirusi, but it must have been in the close neighbourhood of Kalatak, where, indeed, there is ample room for further close investigation amongst surrounding ruins. About the city, we may note from Idrisi that it was nearly as large as Multan, and was the largest city in Makran. "Palm trees are plentiful, and there is a large trade," says our author, who adds that it is two long days' journey west of the city of Firabuz. From all the varied forms which Arab geographical names can assume owing to omission of diacritical marks in writing, this place, Firabuz, has perhaps suffered most. The most correct reading of it would probably be Kanazbun, and this is the form adopted by Elliott, who conjectures that Kanazbun was situated near the modern Panjgur. From Kej to Panjgur is not less than 110 miles, a very long two days' journey. Yet Istakhri supports Idrisi (if, indeed, he is not the original author of the statement), that it is two days' journey from Kiz to Kanazbun. This would lead one to place Kanazbun elsewhere than in the Panjgur district, more especially as that district lies well to the north of the direct road to India, were it not for local evidence that the fertile and flourishing Panjgur valley must certainly be included somehow in the mediæval geographical system, and that the conditions of Khafila traffic in mediæval times were such as to preclude the possibility of the more direct route being utilized. To explain this fully would demand a full explanation also of the physical geography of

Eastern Makran, which can hardly be included in this paper. I have no doubt whatever that Sir H. Elliott is right in his conjecture, and that amongst the many relics of ancient civilization which are to be found in Panjgur is the site of Kanazbun. Kanazbun was in existence long before the Arab invasion of Sind. The modern fort of Kudabandan probably represents the site of that more ancient fort which was built by the usurper Chach of Sind, when he marched through Makran to fix its further boundaries about the beginning of the Mahomedan era. Kanazbun was a very large city indeed. "It is a town," says Idrisi, "of which the inhabitants are rich. They carry on a great trade. They are men of their word, enemies of fraud, and they are generous and hospitable." Panjgur, I may add, is a delightfully green spot amongst many other green spots in Makran. It is not long ago that we had a small force cantoned there to preserve law and order in that lawless land. There appeared to be but one verdict on the part of the officers who lived there, and that verdict was all in its favour. In this particular, Panjgur is probably unique amongst frontier outposts.

The next important city on the road to Sind was Armail, Armabel, or Karabel, now without doubt, Lus Bela. From Kudabandan to Lus Bela is from 170 to 180 miles, and there is considerable variety of opinion as to the number of days that were to be occupied in traversing the distance. Istakhri says that from Kiz to Armail is six days' journey. Deduct the two from Kiz to Kanazbun, and the distance between Kanazbun and Armail is four days. Ibn Haukal makes it fourteen marches from Kanazbun to the port of Debal, and as he reckons Armail to be six from Debal on the Kanazbun road, we get a second estimate of eight days' journey. Idrisi says that from Manhabari to Firabuz is six marches, and we know otherwise that from Manhabari to Armail was four, so the third estimate gives us two days' journey. Istakhri's estimate is more in accordance with the average that we find elsewhere, and he is the probable author of the original statements. But doubtless the number of days occupied varied with the season and the amount of supplies procurable. There were villages *en route*, and many halting-places. The 'Ashkalu l' Bilad' of Ibn Haukal says, "Villages of Dahuk and Kalwan are contiguous, and are between Labi and Armail;" from which Elliott conjectures that Labi was synonymous with Kiz. Idrisi states that "between Kiz and Armail two districts touch each other, Rahun and Kalwan." I should be inclined to suggest that the districts of Dashtak and Kolwah are those referred to. They are contiguous, and they may be said to be between Kiz and Armail, though it would be more exact to place them between Kanazbun and Armail. Kolwah is a well-cultivated district lying to the south of the river, which in its upper course is known as the Lob. I should conjecture that this may be the Labi referred to by Ibn Haukal.

The city of Armail, Armabel (sometimes Karabel), or Lus Bela, is

of such historic interest that it requires far more notice than is possible within reasonable limits for a paper of this description. From the very earliest days of historical record, Armail, by right of its position commanding the high-road to India, must have been of great importance. Lus Bela is but the modern name derived from the influx of the Lus or Lumri tribe of Rajputs. It is at present but an insignificant little town, picturesquely perched on the banks of the Puráli river, but in its immediate neighbourhood is a veritable *embarras de richesse* in ancient sites. Eleven miles north-west of Lus Bela, at Gondakahar, are the ruins of a very ancient city, which at first sight appear to carry us back to the pre-Mahomedan era of Arab occupation, when the country was peopled by Arabii, and the Arab flag was paramount on the high seas. Not far from them are the caves of Gondrani, about which there is no room for conjecture, for they are clearly Budhist, as can be told from their construction. We know from the Chachnama of Sind that in the middle of the eighth century the province of Lus Bela was part of a Budhist kingdom, which extended from Armabel to the modern province of Gandava, in Sind. The great trade mart for the Budhists on the frontier was a place called Kandabel, which Elliott identifies with Gandava, the capital of the province of Kach Gandava. It is, however, associated in the Chachnama with Kandahar, the expression "Kandabel, that is, Kandahar" being used, an expression which Elliott condemns for its inaccuracy, as he recognizes but the one Kandahar, which is in Afghanistan. It happens that there is a Kandahar, or Gandahar, in Kach Gandava, and there are ruins enough in the neighbourhood to justify the suspicion that this was after all the original Kandabel rather than the modern town of Gandava. The capital of this ancient Budha—or Budhiya—kingdom I believe to have been Armabel rather than Kandabel, it being at Armabel that Chach found a Budhist priest reigning in the year 2 A.H., when he passed through. The curious association of names, and the undoubted Budhist character of the Gondrani caves, would lead one to assign a Budhist origin also to the neighbouring ruins of Gondakahar, or Gandakahar, only that direct evidence from the ruins themselves is at present wanting to confirm this conjecture. They require far closer investigation than has been found possible in the course of ordinary survey operations. The country lying between Lus Bela and Kach Gandava is occupied at present by a most troublesome section of the Dravidian Brahuis, who call themselves Mingals, or Mongols, and who possibly may be a Mongolian graft on the Dravidian stock. They may prove to be modern representatives of the old Budhist population of this land, but their objection to political control has hitherto debarred us from even exploring their country, although it is immediately on our own borders. About 8 miles north of Lus Bela are the ruins of a comparatively recent Arab settlement, but they do not appear to be important. It is probable that certain other ruins, about 1½ mile east of

the town, called Karia Pir, represent the latest mediæval site, the site which was adopted after the destruction of the older city by Mahomed Kasim on his way to invade Sind. Karia Pir is full of Arabic coins and pottery. So many invasions of India have been planned with varied success by the Kalifs of Baghdad since the first invasion in the days of Omar I. in 644 A.D., till the time of the final occupation of Sind in the time of the sixth Kalif Walid, about 712 A.D., that there is no difficulty in accounting for the varied sites and fortunes of any city occupying so important a strategical position as Bela.

From Armail we have a two days' march assigned by Istakhri and Idrisi as the distance to the town of Kambali, or Yusli, towards India. These two places have, in consequence of their similarity in position, become much confused, and it has been assumed by some scholars that they are identical. But they are clearly separated in Ibn Haukal's map, and it is, in fact, the question only of which of two routes towards India is selected that will decide which of the two cities will be found on the road. There is (and always must have been) a choice of routes to the ancient port of Debal after passing the city of Armail. That route which led through Yusli in all probability passed by the modern site of Uthal. Close to this village the unmistakable ruins of a considerable Arab town have been found, and I have no hesitation in identifying them as those of Yusli. About Kambali, too, there can be very little doubt. There are certain well-known ruins called Khairokot not far to the west of the village of Liari. We know from mediæval description that Kambali was close to the sea, and the sea shaped its coast-line in mediæval days so as nearly to touch the site called Khairokot. Even now, under certain conditions of tide, it is possible to reach Liari in a coast fishing-boat, although the process of land formation at the head of the Sonmiani bay is proceeding so fast that, on the other hand, it is occasionally impossible even to reach the fishing village of Sonmiani itself. The ruins of Khairokot are so extensive, and yield such large evidences of Arab occupation, that a place must certainly be found for them in the mediæval system. Kambali appears to be the only possible solution to the problem, although it is somewhat off the direct road between Armail and Debal.

From either of these towns we have a six days' journey to Debal, passing two other cities *en route*, viz. Manabari and the "small but populous town of Khur."

The Manhanari of Istakhri, Manbatara of Ibn Haukal, or Manabari of Idrisi, again confronts us with the oft-repeated difficulty of two places with similar names, there being no one individual site which will answer all the descriptions given. General Haig has shown that there was in all probability a Manjabari on the old channel of the Indus, nearly opposite the famous city of Mansura, some 40 miles north-east of the modern Hydrabad, which will answer certain points of Arabic

description; but he shows conclusively that this could not be the Manhabari of Ibn Haukal and Idrisi, which was two days' journey from Debal on the road to Armail. As we have now decided what direction that road must have taken, after accepting General Haig's position for Debal, and bearing in mind Idrisi's description of the town as "built in a hollow," with fountains, springs, and gardens around it, there seems to me but little doubt that the site of the ancient Manhabari is to be found on that resort of all Karachi holiday-makers called Mugger Pir. Here the sacred alligators are kept, and hence the recognized name; but the real name of the place, divested of its vulgar attributes, is Manga, or Manja Pir. The affix Pir is common throughout the Bela district, and is a modern introduction. The position of Mugger Pir, with its encircling walls of hills, its adjacent hot springs and gardens, so rare as to be almost unique in this part of the country, its convenient position with respect to the coast, and, above all, its interesting architectural remains, mark it unmistakably as that Manhabari of Idrisi which was two days' march from Debal.

Whether Manhabari can be identified with that ancient capital of Indo-Skythna spoken of by Ptolemy and the author of the 'Periplus' as Minagar, or Binagar, may be open to question, though there are a good many points about it which appear to meet the description given by more ancient geographers. The question is too large to enter on now, but there is certainly reason to think that such identification may be found possible. The small but populous town of Khur has left some apparent records of its existence near the Malir waterworks of Karachi, where there is a very fine group of Arab tombs in a good state of preservation. There is a village called Khair marked on the map not far from this position, and the actual site of the old town cannot be far from it, although I have not had the opportunity of identifying it. It is directly on the road connecting Debal with Manhabari. With Manhabari and Khur our tale of buried cities closes in this direction. We have but to add that General Haig identifies Debal with a ruin-covered site 20 miles south-west of Thatta, and about 45 miles east-south-east of Karachi.

All these ancient cities eastwards from Makran are associated with one very interesting feature. Somewhat apart from the deserted and hardly recognizable ruins of the cities are groups of remarkable tombs, constructed of stone, and carved with a most minute beauty of design, which is so well preserved as to appear almost fresh from the hands of the sculptor. These tombs are locally known as "Khalmati," or, as I believe it should be written, "Karmati."

Invariably placed on rising ground, with a fair command of the surrounding landscape, they are the most conspicuous witnesses yet remaining of the nature of the Saracenic style of decorative art which must have beautified those early cities. The cities themselves have long

since passed away, but these stone records of dead citizens still remain to illustrate, if even with a feeble light, one of the darkest epochs in the history of Indian architecture. If, as I fully believe, they are really Karmati (*i.e.* Karmatian), they are witnesses also to the strength of perhaps the most remarkable of all those sects of schismatics which sprung up in the early centuries of Islam, and which linked together East and West with a tie of religious sympathy and crime which is almost unparalleled in the history of the world. There were many Moslem heretical sects before the days of the Karmatians; but "the people of the veil," as the Karmatians were called, were almost certainly the Eastern representatives of those Assassins of Syria who obeyed the behests of the old man of the mountain. Karmatians and Assassins appear to have been held together by certain ties of mystic faith (or it may well have been the want of it), and by the practice of secret rites so shrouded and hidden in a veil of mystery as to have rendered them for ever a most fascinating subject of inquiry to the historical student. Karmatian ascendency in Multan ended with the advent of Mahmud of Gharni in 1005; but there have been Karmatian rulers in Sind since those days, and there is a people in Sind who still bear their name. But we are wandering far from the borders of Makran, and must turn back for a space to those western regions which connected our first sea-port Tiz with Persia.

We have so far only dealt with that route to India which combined a coasting voyage in Arab ships with an overland journey, which was obviously performed on a camel, or the day's stages could never have been accomplished. But the number of cities in Western Makran and Kirman which still exist under their mediæval names, which are thickly surrounded with evidences of their former wealth and greatness, certifies to a former trade through Persia to India which could have been nowise inferior to that from the shores of Arabia or Egypt. Indeed, the overland route to India through Persia and Makran was probably one of the best trodden trade routes that the world has ever seen. It is almost unnecessary to enumerate such names as Darak, Bih, Band, Kasrkand, Asfaka, and Fahalfahra (all of which are to be found in Ibn Haukal's map), and to point out that they are represented in modern geography by Dizak, Geh, Binth, Kasrkand, Asfaka, and Bahu Kalat. Degenerated and narrowed as they now are, there are still evidences written large enough in surrounding ruins to satisfy the investigator of the reality and greatness of their past; whilst the present nature of the routes which connect them by river and mountain is enough to prove that they never could have been of small account in the Arab geographical system. One city in this part of Makran is, I confess, something of a riddle to me still. Rasak is ever spoken of by Arab geographers as the city of schismatics. There is, indeed, a Rasak on the Sarbaz river road to Bampur, which might be strained to fit the

position assigned it in Arab geography; but it is now a small and insignificant village, and apparently could never have been otherwise. There is no room for a city of such world-wide fame as the ancient headquarters of heresy must have been—a city which formed a connecting-link between the heretics of Persia and those of Sind.

Istakhri says that Rasak is two days' journey from Fahalfahra (which there is good reason for believing to be Bahu Kalat), but Idrisi makes it a three days' journey from that place, and three days from Darak, so that it should be about halfway between them. Now, Darak can hardly be other than Dizak, which is described by the same authority as three days' journey from Firabuz (*i.e.* Kanazbun). It is also said to have been a populous town, and south-west of it was "a high mountain called the Mountain of Salt." South-west of Dizak are the highest mountains in Makran, called the Bampusht Koh, and there is enough salt in the neighbourhood to justify the geographer's description. It may also be said to be three days' journey from Kanazbun. Somewhere about halfway between Dizak and Bahu Kalat is the important town of Sarbaz, and from a description of contiguous ruins which has been given by Mr. E. A. Wainwright, of the Survey Department (to whom I am indebted for most of the Makran identifications), I am inclined to place the ancient Rasak at Sarbaz rather than in the position which the modern name would apply to it. It is rather significant that Ibn Haukal omits Rasak altogether from his map. Its importance may be estimated from Idrisi's description of it taken from the translation given by Elliott in the first volume of his history of India: "The inhabitants of Rasak are schismatics. Their territory is divided into two districts, one called Al Kharij, and the other Kir" (or Kiz) "Kaián. Sugar-cane is much cultivated, and a considerable trade is carried on in a sweetmeat called 'faniz,' which is made here. . . . The territory of Maskan joins that of Kirman." Maskan is probably represented by Mashkel at the present day, Mashkel being the best date-growing district in Southern Baluchistan. It adjoins Kirman, and produces dates of such excellent quality that they compare favourably with the best products of the Euphrates. Idrisi's description of this part of Western Makran continues thus: "The inhabitants have a great reputation for courage. They have date-trees, camels, cereals, and the fruit of cold countries." He then gives a table of distances, from which we can roughly estimate the meaning of "a day's journey." After stating that Fahalfahra, Asfaka, Band, and Kasrkand are dependencies of Makran which resemble each other in point of size and extent of their trade, he goes on to say, "Fahalfahra to Rasak two days." (Istakhri makes it three days, the distance from Bahu Kalat to Sarbaz being about 80 miles.) "From Fahalfahra to Asfaka two days." (This is almost impossible, the distance being about 160 miles, and the route passing through several large towns.) "From Asfaka to Band one day

towards the west." (This is about 45 miles south-west rather than west.) "From Asfaka to Darak three days." (150 to 160 miles according to the route taken.) "From Band to Kasrkand one day." (About 70 miles, passing through Bih or Geh, which is not mentioned.) "From Kasrkand to Kiz four days." This is not much over 150 miles, and is the most probable estimate of them all. It is possible, of course, that from 70 to 80 miles may have been covered on a good camel within the limits of twenty-four hours. Such distances in Arabia are not uncommon, but we are not here dealing with an absolutely desert district, devoid of water. On the contrary, halting-places must have always been frequent and convenient.

I cannot leave this corner of Makran without a short reference to what lay beyond to the north-west, on the Kirman border, as it appears to me that one or two geographical riddles of mediæval days have recently been cleared up by the results of our explorations. Idrisi says that "Tubaran is near Fahraj, which belongs to Kirman. It is a well-fortified town, and is situated on the banks of a river of the same name, which are cultivated and fertile. From hence to Fardan, a commercial town, the environs of which are well populated, four days. Kir Kayan lies to the west of Fardan, on the road to Tubaran. The country is well populated and very fertile. The vine grows here and various sorts of fruit trees, but the palm is not to be found." Elsewhere he states that "from Mansuria to Tubaran about fifteen days;" and again, "from Tubaran to Multan, on the borders of Sind, ten days." Here there is clearly the confusion which so constantly arises from the repetition of place-names in different localities. Multan and Mansuria are well-known or well-identified localities, and Turan was an equally well-recognized district of Lower Sind, of which Khozdar was the capital. Turan may well be reckoned as ten days from Multan, or fifteen from Mansuria, but hardly the Tubaran, about which such a detailed and precise description is given. There are two places called indifferently Fahraj, Pahrag, Pahra, or Pahura, both of which are in the Kirman district; one, which is shown in St. John's map of Persia, is not very far from Regan, in the Narmashir province, and is surrounded far and wide with ruins. It has been identified by St. John as the Pahra of Arrian, the capital of Gadrosia, where Alexander rested after his retreat through Makran. The other is some 16 miles east of Bampur, to the north-west of Sarbaz. Both are on the banks of a river, "cultivated and fertile;" both are the centres of an area of ruins extending for miles; both must find a place in mediæval geography. For many reasons, into which I cannot fully enter, I am inclined to place the Pahra of Arrian in the site near Bampur. It suits the narrative in many particulars better than does the Pahra identified with Fahraj by St. John. The latter, I have very little doubt, is the Fahraj of Idrisi, and the town of Tubaran was not far from it. Fardan may well

have been either Bampur itself (a very ancient town) or Pahra, 16 miles to the east of it; and between Fardan and Fahraj lay the district of Kir (or Kiz) Kaian, which has been stated to be a district of Rasak. "On Tubaran," says Idrisi, "are dependent Mahyak, Kir Kaian, Sura" (? Suza), "Fardan" (? Bampur or Pahra), "Kashran" (? Khasrin), "and Masurjan. Masurjan is a well-peopled commercial town surrounded with villages on the banks of the Tubaran, from which town it is 42 miles distant. Masurjan to Darak Yamuna 141 miles, Darak Yamuna to Finabuz 175 miles." If we take Regan to represent the old city of Masurjan, and Yakmina as the modern representative of Darak Yamuna, we shall find Idrisi's distances most surprisingly in accordance with modern mapping. Regan is about 40 miles from Fahraj, and the other distances, though not accurate of course, are much more approximately correct than could possibly have been expected from the generality of Idrisi's compilation.

I cannot, however, now open up a fresh chapter on mediæval geography in Persia. It is Makran itself to which I wish to draw attention. In our thirst for transfrontier knowledge further north and further west, we have somewhat overlooked this very remarkable country. Idrisi commences his description with the assertion that "Makran is a vast country, mostly desert." We have not altogether found it so. It is true that the voyager who might be condemned to coast his way from the Gulf of Oman to the port of Karachi in the hot weather, might wonder what of beauty, wealth, or even interest, could possibly lie beyond that brazen coast washed by that molten sea; might well recall the agonies of thirst endured during the Greek retreat; might think of the lost armies of Cyrus and Simiramis; and whilst his eye could not fail to be impressed with the grand outlines of those bold headlands which guard the coast, his nose would be far more rudely reminded of the unpleasant proximity of Ichthyophagi than delighted by soft odours of spikenard or myrrh. And yet, for century after century, the key to the golden gate of Indian commerce lay behind those Makran hills. Beyond those square-headed bluffs and precipices, hidden amongst the serrated lines of jagged ridges, was the high-road to wealth and fame, where passed along not only many a rich Kafila loaded with precious merchandise, but many a stout array of troops besides. Those citizens of Makran, who "loved fair dealing, who were men of their word, and enemies to fraud," who welcomed the lagging Kafila, or sped on their way the swift camel-mounted soldiers of Arabia, could have little dreamed that for centuries in the undeveloped future, when trade should pass over the high seas round the southern coast of Africa, and the Western infidel should set his hated foot on Eastern shores, Makran should sink out of sight and into such forgetfulness by the world, that eventually this ancient land of the sun should become something less well known than those mountains of the moon in which lay the far-off sources of the Egyptian Nile.

ON A JOURNEY FROM MACHAKO'S TO KITWYI.*

By JOHN AINSWORTH.

On the 21st ult. I left the station in company with Mr. Gilkison. I took the necessary porters and twelve askari from here, and supplemented these by the addition of fifty native volunteers. On my arrival at Mala, Mwatu desired me to take a number of his warriors. I preferred not to, however, but agreed to take twenty of his men. He then asked permission to accompany me, and to this I also agreed, as I had an idea that if I made friends with Kitwyi, I might be able to include Mwatu in the same arrangement (for years Mala and Kitwyi have been enemies, and a constant series of raids and counter-raids have been carried on). After leaving Mala, where we were liberally supplied with flour posho by the wazee (Mwatu himself having provided two bullocks for the men), we proceeded to the Athi, the route lying in a north-east direction from Mala. The Athi at this crossing is a stream some 40 yards broad, and just now is about 5 feet deep, consequently it must be impassable during the rains. Above the north-east bank of the river there is an abrupt rise of about 400 feet, terminating in a plateau or a large extent of plains. This plateau appears to continue throughout the whole course of the river on its left-hand side. The same plateau-like formation is visible from the caravan road at Tzavo and Kinani. Leaving the Athi river camp, we proceeded across the Yata plains (Athi pleateau) in north-east and easterly directions, and eventually descended to a lower level, which evidently forms part of the Thana ("Tana" of the maps, but pronounced by the natives "Thana") watershed. We encamped on the east side of the Chyanu river. The country up to this had begun with thick bush; afterwards it opened out into expanses of plains, and then assumed a park-land appearance. When nearing the Chyanu river the bush begins to be thick again. On the 24th idem we left Chyanu camp for the Tiva river, which, after a long march, we reached. The country from Chyanu begins to be hilly. From Mala to the Kakuneke hills (just above the Chyanu camp) we had been following a very ill-defined track—in fact, in some places we had no track at all; but when about 4 miles from Chyanu we struck a well-worn path, which turned out to be the main safari track between Meranga (Kikuyu) and Kitwyi, proceeding thence to the coast *viâ* Ikutha and the Sabaki. This path led us through an uninhabited country in a south-easterly direction to the Tiva river. The country may be described as rolling, and with isolated hills here and there. There are many water-courses, but all except the Mikununi river were dry. As the Mavani hills are cleared, a distant

* From a report dated "Machako's, February 6, 1895," addressed to the administrator of the British East Africa Company at Mombasa. Map, p. 452.

view of the Kitwyi hills is obtained to the east and north-east, with the lower-lying parts of the district in the medium distance, while the Ulu district is seen to the west. After a long march we reached the Tiva river, a distance of about 18½ miles from the Chyanu river camp. The country nearly up to the Mavani hills is what may be termed parkland, but from Mavani to the Tiva it is fairly thickly timbered: but, except at the Tiva river, there is no good timber. There is an abundance of game on this route. This road passes through a thickly wooded country. Very little good timber is seen. About 6½ miles from the Tiva we came across the first shambas since leaving Mala, and now we were in Kitwyi. Another 7 miles brought us to the village of the chief, Simba Mwylu, in the district of Kitwyi called Nengia. The country is fairly rough, and is intersected by several streams. There is apparently a large area under cultivation. Maweli and mohindi seem to be the principal grains that are cultivated. Cattle and goats are abundant. I should consider the country as being somewhat thickly populated. The dress and manners of the people are much the same as the Wakamba of Ulu (Machako's district), and the language is nearly the same, there being a slight change of dialect. Their mode of cultivation is somewhat varied from that of the Ulu people, inasmuch as many Swahili hoes are used, but the crop seem much the same. The houses are almost the same as those in Ulu; but one thing I noticed particularly was, that the young men and women were not nearly so artistically or fancifully dressed as the natives of Ulu. The natives seem to have taken liberally to the use of cloth.

Kitwyi is a large tract of country. The district of Nengia is the part nearest to the Ulu side of the country. Kitwyi extends north and east from Nengia. There are larger tracts of country south-east and south, extending to beyond the parallel of Kibwezi, inhabited by Wakamba. Mumoni lies about north-north-east from Nengia, and is about four days distant. Kitwyi is some 1500 feet lower altitude than Machako's.

The day we arrived at Kitwyi I met the chief, Simba Mwylu. He is a small, spare man, who speaks a little Kiswahili. He said that he knew of the "Mzungu" at Machako's very well, and explained that he wanted to be friends, etc. I explained to him that that was also my wish, and with that object I should like to meet all the local wazee. He promised that these should all come in. After the preliminaries, I told him that I should like to know about the "shauri" of the Wagiriama and their ivory. He explained that he was perfectly willing to confront the Wagiriama and have the matter thoroughly gone into, so I called the Wagiriama, who had accompanied the safari. Sara, the Wagiriama head-man, states as follows: "We were a safari of Wagiriama returning from Mumoni with ivory, and when we were near Simba's village we were attacked. Seven Wagiriama were killed; the remainder

threw away their ivory and cleared. Many safaris of Wagiriama have passed through the district, but this is the only instance, as far as I know, of any such thing having happened."

Simba Mwylu's statement runs as follows: "Some time ago two of my sons were killed and their goats and ivory taken by Wagiriama in the Giriama country, and I accuse Sara of being the murderer of my sons. In revenge this Giriama caravan was attacked. When Sara and his people passed up to Mumoni, I had not heard of the death of my people; it was only after the Wagiriama had left that I got the information, and then I and my people decided to await the return of the Wagiriama from Mumoni."

Sara admitted that some Wakamba had been killed in his country, but denied having had anything to do with the crime, and that he had only heard of it after his return to Giriama. My *decision* on the case in question was, that, the attack on the Wagiriama having occurred at a time when the Wakamba were not under any influence of the Company, they had acted simply after their own crude ideas of self-defence or vengeance, so could not be held responsible to the Company for their action. I therefore only ruled that any property taken by the Wakamba from the Wagiriama be handed over to the Company for restitution to the latter. Simba at once declared his readiness to abide by this finding, and handed over to me five pieces of ivory, which the Wagiriama recognized as theirs.

On the 25th ult. I met all the local wazee, who brought as presents four bullocks and some sheep. The result of my "shauri" with them was very satisfactory. All serious matters they promised to refer to Machako's, and they one and all expressed a wish that we should build a station amongst them. I promised to build a post, and to consider the matter of a station. After this I brought forward Mwatu of Mala, and explained that he, Mwatu, had purposely come along to make friends, and so stop the system of continual raids. Simba then came forward and said that he should be very glad to make friends with Mwatu. So a goat was brought, and the ceremony of blood-brotherhood was gone through by the two chiefs. Thus I hope raids between Mala and Kitwyi have become things of the past.

On inquiry I learned that it was a very common occurrence for Swahili caravans to pass through Kitwyi with lots of women and children. The natives say that these women come from Meru (Kenia district) and Meranga. It appears that these Swahilis sell these women in Kitwyi for cattle, and with the cattle they return to Mumoni to buy ivory. The wazee informed me that they had a shauri with a place called Givuni. They accused the Givuni people of having "lifted" twenty-five of their cattle. They asked me if I would try and settle the matter. This I promised to do, and for that purpose four wazee from Nengia accompanied me on to Givuni.

Upon coming into Kitwyi on the 25th, I induced a native to act as our guide to the village of Simba. On the way he gave us all the news, and amongst other things told us that there was a safari of Swahilis at Simba Mwylu's, and that this safari had brought in a lot of women. When questioned, he said that he could show us a boma where there were some Masai women that belonged to the Swahilis. So I went at once to this place, where I found four Masai women and two children. These we brought along with us to our camp at Simba's, and on arrival there I ordered all the Swahilis to turn up. The women then pointed out among the lot the two men who were their owners. The men denied the ownership or any knowledge of the women, but afterwards admitted that the women were their "friends," and that they wanted them for their "concubines," etc. As there was no doubt in my mind about the business (Mr. Gibson and myself were perfectly satisfied that it was a slaving matter), I arrested the two men, seized their effects, and took them along with me to Machako's. From what I heard I feel sure that there were many more women about, and no doubt the other Swahilis had been slaving; but I could prove nothing against them, and I could get no more definite information from the natives. So, considering the circumstances, I compelled all the Swahilis to leave the country, and took them on with me to Machako's. From here they have proceeded to Mombasa by the main safari route.

There is no doubt in my mind but that Kitwyi has for many years been a regular *rendezvous* for Swahili, etc., slave-traders. Some Swahilis appear to be semi-resident in the country; consequently, to any one just visiting the country there are many difficulties in the way of obtaining all the information required. And the only possible way of doing any good against this slave traffic is to occupy the country, by which I mean the building of a station with a European in command. This European could take command of Kitwyi and the adjacent country together with Mumoni. By the erection of this station, and with Machako's and the existing posts in Mala and Ngoleni, we could almost control the whole coast traffic in this part of the territory.

On the 27th ult. we left Kitwyi on our return to Ulu. Ten young men from Nengia accompanied us, with the intention of going on to Machako's to see the fort. The road lay south-west to the Tiva river. For about 5 miles from Simba's we found the country populated and cultivated. For another mile further on it was cultivated only, and then for 52 miles to the Tiva river the road lay through thick bush over a fairly level country. The Tiva here is about 30 yards wide, but is dry. Water, however, can be obtained by digging about a foot in the sandy bed. The elevation of the Tiva river camp is 3400 feet above sea-level. We left the Tiva river on the 28th ult., and passed along a level country covered with bush. A little over 5 miles brought us to the ascent of the Athi escarpment, and here again we were

amongst cultivation and population. This district is called Yata. We passed through a thickly populated and extensively cultivated district to the Athi river; the country is a very pretty one. Nearly 3 miles from the Athi escarpment we commenced a descent to the Athi river, and this descent continues for nearly 5½ miles, which makes the distance from the Tiva to the Athi about 13½ miles. The Athi at this point is some 50 yards wide, with 9 inches of water, and presents the appearance of a well-used ford. In Yata we saw very little cattle until we got close to the Athi.

The whole country is fairly well favoured with timber, and gives one the idea of recent occupation; indeed, I understand from the natives that within recent times all Yata was inhabited by Masai. But now there is certainly a very large population of Wakamba, who have come over from the Ulu side.

From what I learned, we were the first Europeans who, as far as the natives knew, had ever passed through the country.* The people here showed every confidence by coming on to the road and into camp. The elevation of this camp is 3360 feet above the sea-level, and is about 25 miles from Nengia (Kitwyi). We left the Athi river camp on the 29th ult., and proceeded in a westerly direction towards Givuni, which place we duly reached after about a 12-mile march. The road was a very rough one; it is intersected by numerous watercourses, most of which are now dry, but there is plenty of water on the route. The whole of the country passed through is thickly populated. Upon arrival at Givuni I explained to the wazee the reason why the wazee of Kitwyi had accompanied me, and they agreed to hand over the cattle. This was done the same evening, and the next day the wazee of Kitwyi left for their homes with the cattle. Several wazees of the Givuni locality came into camp with sheep as presents. Givuni and all the adjacent country seems to be very rich in cattle. There is not, apparently, so much cultivation as in other parts of the district. The height of Givuni camp above sea-level is 4150 feet.

On the 30th ult. we left for Manyala, passing through Kiteta *en route;* the road leads exactly west, and is a very tortuous one. We eventually reached the camp at Manyala after covering nearly 17 miles. The country for about 2 miles beyond Givuni is moderately cultivated; there are large quantities of cows and goats. The wazee of Manyala, who are still friends, sent us in a lot of flour as food for the men, and sent sheep for our own use.

The height of Manyala camp above sea-level is 4360 feet. All the country from the Athi to Machako's is very well supplied with water.

On the 31st ult. we shifted camp some 2 miles further along the

* Dr. L. Krapf (1849) was the first to pass through Kitwyi (Kitui) on his journey to Mumoni He calls Milu's (Mwylu's) village Kokungu.—Ed.

road to Iyani (Manyala), and here we held a "shauri" with various wazee. They sent us in further presents of flour, and twelve loads, some sheep, and a bullock. At this point Mwata and his people left us and proceeded to Mala. This point is about 56 miles from Nengia (Kitwyi). On the 1st inst. we left Manyala on our way to Machako's, and passed through Nga into Gani, reaching Machako's at 11 a.m., the distance from Iyani being about 12 miles, which makes the distance from Kitwyi *viâ* Givuni and Manyala about 58 miles. The whole of the country from Yata to Machako's is thickly populated, and, except in one or two localities, is fairly cultivated, and right from the Athi to this station it appears to be very rich in cattle. After leaving the country between the Athi river and Givuni, trees become a rarity instead of an abundance, as in the country between Kitwyi and the Athi.

I enclose a traverse of the route, showing roughly the various positions, and I trust it will be found fairly correct. In its construction all angles have been taken by the prismatic compass; all bearings are magnetic, and the distance is taken by pacing and a watch. The base marked off was Mala, and the scale used was 5 statute miles to the inch. The position of the Kanjalu range is taken from the Railway Survey Map.

Machako's, February 29, 1895.

Kitwyi—to the east of Ulu—is a large tract of country said to be as large as the Ulu country; it has a much lower elevation than Ulu, and consequently is much hotter. The country lies between the Athi and Thana rivers, and all its rivers drain into the Thana. The people, the production, etc., are much the same in this part as in Ulu, and both are large cattle countries. Like all Wakamba, the people are keen traders. Kitwyi is on the main road to Mumoni, Meranga (Kikuyu), Thaka, and the Laikipia country.

There are * two routes from the coast to Kitwyi, one *viâ* Kibwezi and then north-east, and one which strikes nearly east from Nzawi; I should say that the one *viâ* Kibwezi is the nearest. I should estimate the country as being thickly populated and cultivated; the climate, although hotter than Ulu, is, I should say, fairly healthy, the average altitude would be from 3500 to 4000 feet above sea-level. Many of the Ulu people were not on good terms with Kitwyi, and the Kiseini people (Kiseini is north of Kitwyi, and east of the Athi river) often raid in Mala and Kitwyi, as also Givuni and Kitwyi were up to lately enemies, but I am pleased to say that our intervention has done away with that state of things. Mumoni, Thaka, and Meranga (in Kikuyu) and Nzawi are all friends of the Kitwyi people.

* A third striking across to the junction of the Tzavo with the Athi, and thence by Bechuma, etc. (J. R. W.P.).

Since the occupation of Ulu by the Company, Kitwyi has been the principal *rendezvous* for slave-traders in this part of the territory. Our late expedition there, and the fortunate capture of some Swahili slave-traders red-handed in their business, will, I feel sure, have a good effect in Kitwyi; but, in my opinion, it is urgently necessary that the country be occupied, and be administered by nearer means than Machako's. There is, I understand, a lot of traffic in ivory and slaves through Nengia (Kitwyi), and of these caravans some pass down the Sabaki to Takaungu, while others strike right across German territory, and eventually make Pangani. Independent of the above-mentioned traffic, there is a very fair trade in cattle, etc, in the country, and many Swahilis are at times semi-resident in the country; many Wagiriama traders also come into this country and Mumoni to buy cattle and ivory, and at times many Kitwyi people go down to Giriama and Mombasa to trade.

Another important matter is as follows. In Meranga there are a great many unfortunate Masai women slaves of the Wakikuyu. Many of the Swahili traders coming through Meranga from Baringo, Kavirondo, etc., buy a lot of these women cheap; the Swahilis then come to Kitwyni, where they sell some of these women for cattle. They then send a party to Mumoni with their cattle to buy ivory. I understand that the Kitwyi people will not undertake the risk of taking cattle to Kikuyu to buy women, while, on the other hand, the Wakikuyu will not risk bringing the women into Kitwyi, and so the Swahili is the middleman. To control all this it is very necessary that a European officer should be resident in the country.

Personally I am very well pleased with the result of my visit. I found the people very friendly, and very anxious that a European should come and reside amongst them. On my return several young fellows accompanied us to Machako's, mainly to see the station, etc.

GEOGRAPHICAL WORK OF THE GEOLOGICAL SURVEY OF CANADA IN 1895.

By Dr. GEORGE M. DAWSON, C.M.G., F.R.S.

THE work of the Geological Survey of Canada in 1895 has been largely devoted to the systematic mapping of definite areas, and did not include nearly as much geographical exploration as that of the preceding year.

In British Columbia, Mr. R. G. McConnell and Mr. J. McEvoy were engaged respectively upon the West Kootanie and Shuswap sheets of the geological map, the geographical and topographical delineation of the country proceeding in both cases concurrently with its geological examination. A great development of mining is in progress in British

Columbia, more particularly of the precious metals, and the West Kootanie district is now occupied by a large mining population, although a few years ago it was practically an untrodden wilderness.

To the east of the northern part of Lake Winnipeg, in Manitoba, Mr. J. B. Tyrrell carried out surveys of an exploratory nature, laying down the courses of several rivers and ascertaining the positions of a number of lakes, as well as the geological character of the country, which proved to be characterized entirely by granitic and gneissic rocks.

In the Rainy river and Thunder bay districts of Western Ontario, Mr. W. McInnes completed the information necessary for the Seine river and Shebandowan map-sheets, and a preliminary edition of the first-named sheet has been published, in order to meet the requirements of the miners engaged in the discovery and preliminary exploitation of auriferous quartz-veins there. The rocks met with are all referable either to the Laurentian or to the Huronian system, the latter being that containing the gold-bearing deposits. Similar conditions recur in the country adjacent to the Upper Ottawa, in the vicinity of lakes Temiscaming and Nipissing, where the greater part of the season was spent by Mr. A. Barlow. The adjacent Sudbury district is well known because of its nickeliferous pyrrhotites, and similar ores are in process of discovery in the Huronian rocks of the farther region here particularly referred to. It includes also one of the typical Huronian areas originally described by Sir William Logan, the re-examination of which, in the light of modern petrographical methods, is producing many facts of scientific interest.

Systematic surveys of both sides of the lower part of the Ottawa were also continued by Dr. R. W. Ells, and in the tract between the Ottawa and St. Lawrence by Mr. N. J. Giroux. The general geological features have here long been known, but they are now being laid down for the first time in some detail on the scale of four miles to the inch.

In the northern part of the province of Quebec, an exploration of considerable geographical and geological interest was carried out by Dr. R. Bell, who crossed the height of land from Grand lake, near the sources of the Ottawa, and descended the Nottaway or Noddawai river to its mouth on James bay. Much of the country traversed, although relatively near to inhabited centres, had not before been mapped, and it had remained uncertain whether the stream known to rise near Grand lake was part of the Nottaway system or that of a river emptying further to the west, in Hannah bay. A large area of Huronian rocks was here again met with.

Examination made in that part of Quebec to the south of the St. Lawrence by Mr. R. Chalmers, were directed chiefly to the alluvial gold deposits and to the facts of the glacial period which bear directly

upon these. Terraces marking late-glacial sea-margins were measured to a maximum certain height of 885 feet, and evidence appears to be accumulating to show that these represent the "Iroquois beach," or terrace, of the region of the Great lakes, and these must in that case have been at the time in direct connection with the sea, forming an extensive inlet.

To the north of the Gulf of St. Lawrence, Mr. A. P. Low continued his explorations of the Labrador peninsula by ascending to the sources of the Manikugan river, and examining a tract of country on both sides of the main watershed about its sources. Granites, with Laurentian gneisses and limestones, and intrusive masses of anorthosite, characterize the whole region traversed.

In Nova Scotia, Mr. H. Fletcher was employed in revising the maps of the Sydney coal-field of Cape Breton, preparatory to the issue of a new edition of these; and Mr E. R. Faribault continued his detailed mapping of the Cambrian gold-bearing rocks of the Atlantic coast, for publication on the sale of a mile to the inch. The auriferous quartz-veins are here intimately connected with the anticlinal axes, which it is therefore necessary to trace out with all practicable precision.

In the absence of any trustworthy, detailed, and connected topographical surveys, all the work above outlined has implied measurements and traverses of country adding materially to geography. It is impossible, under the circumstances, to employ methods of great precision, the means adopted being in each case commensurate merely with the requirements of the scale adopted, but the resulting maps are always far in advance of any previously existing.

During the year 1895 twenty-six maps in all have been issued by the Geological Survey.

GENERAL CHAPMAN'S PROPOSED MAPPING OF AFRICA.

Mr. J. Temple Horne, the surveyor-general of Cape Colony, has issued a report dealing with General Chapman's proposals, and directs attention to the important geodetic surveys which have been carried out in South Africa since 1840. A complete series of primary triangles already connects Cape Town with the country near the lower Orange river and with Natal. In British Bechuanaland surveying operations were begun in 1886, when Lieut. Laffan measured a base-line near the Hart river, and a series of primary triangles has now been carried from the twentieth meridian to the boundary of the South African Republic. The work still to be done to render this colonial network of primary triangles complete includes the measurement of three additional chains of triangles, namely, one across the Orange Free State, joining Natal to Kimberley; a second to join Kimberley to the eastern part of the

Bechuanaland survey; and a third connecting the western part of that survey to the triangulation carried by Sir Thomas Maclear in the direction of the lower Orange river. With a view to a further extension of geodetic operations, the surveyor-general suggests that three chains of triangles should be pushed due northward, namely, one in the west, through German South-West Africa; a second, in the centre, from Kimberley to the Victoria falls of the Zambezi; and a third, in the east, from Natal to the Zambezi. These three chains would be joined by a cross-chain of triangles following the parallel of lat. 18° S. He proposes, moreover, that simultaneously with this triangulation, and in connection with it, a staff of trained surveyors should be employed to make rapid topographical surveys. The work thus proposed would necessitate the co-operation of the governments of Germany, the South African Republic, and Rhodesia; and he suggests that the combination of work of this kind should be entrusted to an international commission, organized on the lines of the Geodetic Institute, which has for many years directed the geodetic operations in Europe.

We hail Mr. J. T. Horne's scheme most cordially, and trust that he may be enabled to carry out the work proposed. In the mean time, it might be of some service to utilize the telegraph, which already joins Kimberley with Lake Nyasa, for determining a number of good longitudes.

A map of Cape Colony on a scale of 1:800,000, based upon this triangulation and other surveys, is stated to be nearly ready for publication.

RECENT GAZETTEERS.

THE announcement of a new Gazetteer too often conceals the production of old work under a new title, with superficial revision enough to support a specious prospectus. It is consequently with feelings of grateful acknowledgment, which will be shared by all working geographers, that we are able to call attention to two Gazetteers of the World recently completed, which are new in the best sense, in being original compilations from official sources. The first* and larger is French in authorship and publication, but cosmopolitan in scope and aim. Commenced in 1879 by M. Vivien Saint-Martin, it was completed last year by M. Louis Rousselet, and the fact that it has been sixteen years in course of publication is its most serious defect. The seven large quarto volumes, comprising close on twenty thousand columns of close print, are already in course of being brought up to date by an extensive supplement,

* Nouveau Dictionnaire de Géographie universelle contenant la Géographie physique, la Géographie politique, la Géographie économique, l'Ethnologie, la Géographie historique, la Bibliographie. Ouvrage commencé par M. Vivien de Saint-Martin, et continué par Louis Rousselet. Paris: Hachette et Cie. 7 vols. 1879–1895.

which is intended to be bound with the main work, and is published without pagination, so that it can be divided and placed at the end of each volume, or bound as a supplementary volume. The 'Dictionnaire' is really a concise geographical encyclopædia, the articles on continents, countries, and provinces running to a considerable length, and all of them are systematically subdivided on a uniform plan, so that reference is easy. Admirable bibliographies are added to the longer articles, and this feature of itself renders the work invaluable to students seeking farther information than the notices contain. M. Vivien Saint-Martin's work is a companion for a student, and as a standard work of reference it has made its reputation, and will long retain its value. We call attention to it particularly because there is no English work on the same scale; and, indeed, we know of no book so likely to yield satisfactory information regarding an out-of-the-way part of the world. The orthography is very carefully attended to, but of course, in the case of phonetic renderings of native names in Africa and other undeveloped lands, and in the transliteration of Russian, the French system is employed; in the case of all civilized states, however, the official spelling is followed.

A smaller but, in its own way, equally important work is that compiled by Mr. Chisholm,* who has made it a model of comprehensiveness and compactness. Being of somewhat cumbrous dimensions, the book is less handy than if it had been bound as two smaller volumes; but there is an advantage in having all the information it contains compressed between two boards. In three thousand five hundred columns Mr. Chisholm has compiled an entirely new Gazetteer, every article written afresh, replete with the latest statistics, and verified by competent authorities. Besides the names of ten authors who have contributed signed articles on important places and subjects, a list is given of three hundred and twenty-four persons who have assisted in revising notices. These facts of themselves give great confidence as to the trustworthiness of the work, and repeated testing of the references entirely confirms that confidence. Mr. Chisholm has devoted special attention to the spelling of place-names, and his Gazetteer is the nearest approach yet made to an authentic geographical index carried out on the principles laid down by the Royal Geographical Society. Numerous common prefixes to geographical names receive a note explaining their meaning and application, and, in addition to modern place-names, a certain number of obsolete and classical synonyms is introduced. General subjects, such as oceans, continents, etc., are also included. Populations are dealt with in a somewhat novel way, being expressed in round numbers, and, in the case of villages and small towns, often given as < 500, < 2000, etc. This,

* Longmans' Gazetteer of the World. Edited by George G. Chisholm, M.A., B.SC. London: Longmans, Green & Co, 1895. Pp. 1788.

while quite close enough for purposes of general reference, makes correction of the statistics in later editions a much easier task than it would otherwise be. There are some omissions, due undoubtedly to accident, but, all in all, the work is full and very thorough, and has the crowning advantage of being all brought down to one date, and that date is the very year of publication. The labour involved in the compilation of such works can hardly be imagined by those who have not taken part in similar productions, and it is pleasant indeed to see a Gazetteer where every labourer gets due credit for the part he has taken in it. For this possession Messrs. Longmans have earned the gratitude of all who require fresh, accurate, and responsible information as to places at home and abroad.

On a similar plan, though with a different balance, we may note the new edition of Ritter's well-known German Geographical Dictionary.* It is too familiar to geographers, and too much valued, to require more than a statement of the publication of the new edition.

Mr. Brabner's Gazetteer † is on a different footing from the others we have noticed, as it refers only to a small area—that of England and Wales—and appeals to popular rather than to scientific demands. There are numerous maps, town-plans, and many illustrations of scenery, and the details given of the parishes, the churches, the statistics, including the value of the various livings, should be of interest locally. The limitation to England and Wales deprives the work of some of its value, and the absence of a date on the volumes is to be regretted. A praiseworthy effort has been made to bring the articles up to date; it has not been always successful.

DR. PARTSCH'S 'SILESIA,—A GEOGRAPHICAL STUDY.'

DIFFERENCES of opinion as to the precise limits of geographical science, or the best methods of describing particular countries, cannot be wholly removed by mere abstract discussion alone: the final judgment must rest on criticism of a body of original work contained in individual geographical monographs. It is only after the operation of a special method has been fully observed in its application to different branches of the subject, that it becomes possible to decide upon its effective merits. The 'Landeskunde von Schlesien,' by Professor Dr. Joseph Partsch,‡ a brilliant example of the successful application of certain

* Ritter's Geographisch-statistisches Lexikon. Achte vollständig umgearbeitete vermehrte und verbesserte Auflage. Unter der Redaction von Johs. Penzler. 2 vols. Leipzig: Otto Wigand, 1895.

† The Comprehensive Gazetteer of England and Wales. Edited by J. H. F. Brabner. London: William Mackenzie (not dated). 6 vols.

‡ *Schlesien.* 'Eine Landeskunde für das deutsche Volk auf wissenschaftlicher Grundlage bearbeitet, von Dr. Joseph Partsch, ord. Professor der Erdkunde an der Universität Breslau.' I. Teil. Das ganze Land. Mit 6 farbigen Karten und 23 Abbildungen. Ferdinand Hirt: Breslau, 1896.

geographical methods, may be taken as an excellent specimen of the kind of work to which we refer. Equally removed from the encyclopædic compilation and the merely entertaining popular narrative, it is remarkable both for its wealth of information and for its power of graphic description. The first volume (just published) pictures the country in its purely natural aspects, and explains how far the civilization and history of the inhabitants are dependent upon these. The second volume (not yet issued) contains—arranged according to locality—detailed studies of individual districts which have gained marked characteristics through the joint influences of their natural peculiarities and their inhabitants.

The general interest, to which this work may justly lay claim, arises from its subject as well as from the mode of treatment. Silesia, that "zehnfach interessante Land," as Goethe called it, deserves the epithet partly because of the great variety of its surface, due to its situation on the border of the "Schollenland" of Western Europe, towards the two other tectonic regions into which the European part of the Earth's crust is divided—the plateau of North-Eastern Europe, and the "Faltengebirge" of the Alpine system (in the Carpathians); and partly because it has been the scene of great events in European history. In the year 1241 the weight of the Mongolian inrush was borne by the Silesian knights at the battle of Wahlstatt; and again Silesia was noted in the wars of Frederick the Great, the most fruitful part of the long series of conflicts being that of which, in consequence of its position, Silesia was the scene. This matter of position, exactly on the crossing of the two great trans-continental lines—that on the one hand joining Western Europe with its moderate climate, its cultivations, and its civilization to the great Russian plateau, and that on the other dividing Northern from Southern Germany—is at the same time responsible for the fact that Silesia has never developed into an independent political unit, but has always been more or less indebted to her neighbours. Not only from Germany, but from Bohemia, Poland, and even Hungary, has Silesia sought for the political support necessary to enable her to develop her immense natural resources in peace. Since Frederick the Great's time by far the greater part of Silesia has belonged to Prussia (15,558 square miles), only two small regions, separated from one another by the north-eastern extremity of Moravia, belong to Austria (1989 square miles). From a review of the development of the regional geography of Silesia up to the present time, its position in the European economy can be described in the manner just indicated, and by an inquiry into the linguistic and documentary evidence as to the origin of the name (from "Pagus Silensis," a Germanic tribe which, in the migration with the Vandals, reached the southern point of Spain, and there disappeared), the historical idea of Silesia can be traced through a comprehensive view of the development of its political frontier, and the relation of that frontier

to its natural boundaries. In Dr. Partsch's book the greatest amount of space is devoted to a description of the mountain structure, which is treated from a strictly morphological point of view in a singularly luminous manner. First, there are the Beskids, culminating in a conical sandstone peak, the Lysahorn (4360 feet), and crossed by the Jablunka pass, which forms the closest connection between Silesia and Hungary; then, in the south and south-west, the Sudetic mountains, culminating at 5280 feet in the Schneekoppe, and forming the true boundary between Prussia and Austria; and finally, in the south-east, the hill country of Upper Silesia, with its great mineral wealth, backed by the Annaberg (1350 feet), the most easterly cone of Tertiary basalt in Europe. Further to the north-east and north the watershed is circumscribed by the wide valley courses running east and west, which Behrend has shown to be the beds of glacial streams; and between this region and the Sudetic mountains lies the Silesian plain, a notable south-eastern offshoot of the great plain of North Germany, formed from the ground moraines of ice masses derived from the same sources as the huge glaciers which overflowed the north-eastern counties of England during the Glacial period. The perspective of the picture is made more striking by a glimpse into the unmeasured geological past; the sequence from the epoch of the oldest gneiss to the disappearance of the last of the glaciers, passing before the mind of the reader in a series of vivid pictures.

The water-system of the country is wholly related to the Oder and its tributaries. The description centres round its natural distribution, and leads to an inquiry as to the resulting facilities for inland navigation. Considerable attention is necessarily given to the climate; Silesia lies in the same latitude as the Thames, but while the mean temperature of the warmest month in London is 64·2° Fahr., at Breslau it is 65·3° Fahr., and the coldest months average 38·3° Fahr. and 31·5° Fahr. respectively. More to the eastward the extremes of temperature are greater. At Saratow, on the Volga, we find 71·1° Fahr. and 13·6° Fahr., and the climate of Silesia may accordingly be regarded as intermediate between the oceanic and continental types. Dr. Partsch discusses the distribution and variations of temperature, humidity, and rainfall, the last from approximate data published by himself in Kirchhoff's *Forschungen* last year. The consideration of the flora and fauna from the climatic point of view, introduces the subject of the distribution of population; the changes which have taken place during historic time are investigated with the help of the older maps—one in an edition of Ptolemy being of special interest. Many new facts have been brought to light concerning the earlier periods, and the modern conditions are dealt with statistically. Since the middle of last century, the population has nearly quadrupled (in 1890 it was 4,225,000). The retreat of the Polish language before the German, which began in the twelfth

century, has ceased during the last thirty years; the Polish element now constitutes about 23 per cent. of the population. The Catholic and Evangelical creeds are pretty evenly balanced.

GLASER ON THE ABYSSINIANS.—REVIEW.*

Dr. Glaser has already contributed valuable work towards the elucidation of old-world history and geography in his 'Skizze des Geschichte Arabiens,' published six years ago; meanwhile he has travelled much, and collected many inscriptions in Yemen, and has made as many friends amongst the shiekhs in Arabia as he has enemies amongst the savants of Austria, his native country. The work before us is undoubtedly a great contribution to science, though dealing with only one side of his subject, namely, the tracing of the origin of the Abyssinian kingdom to its home in Arabia. Habasat or Pwent, commonly called Punt, was their original home, a land just east of the Mahir country in South Arabia, now known as Dhofar, where they gathered frankincense and myrrh, and then they carried this trade with them to Somaliland and Abyssinia, founding the kingdom of Axum in this latter country. From inscriptions found by Dr. Glaser in Arabia, and from those brought home by Mr. Theodore Bent from Abyssinia, the identity of the old name of Habasat on both sides of the Red Sea is clearly established, and the derivation of Abyssinia from it proved.

Habasat, or Habis, was used in most ancient times. Max Müller, in his work, 'Asia and Europe,' p. 116, states that an old name of the inhabitants of Pwent, which, however, only appears in poetical use in Egyptian texts, was "the people of the district of *Hbst*," "the *Hbsti*." Dr. Glaser says that this term Habasat extends over both sides of the Gulf of Aden, and included Somaliland, and that Egyptian ships probably traded with all these coasts, and adds, "We not only find up to the present day along a great stretch of the South Arabian coasts, but also inland from them, as well as in Sokotra, a peculiar idiom which agrees with no pre-Islamite idiom as closely as with Amharic, a circumstance which also struck Basil, the author of the 'Periphes' (56–67 A.D.), and he mentions that from ancient times nearly the whole of the African coast from Ras Hafun to the Portuguese possessions had been conquered by the inhabitants of Musa, and therefore belonged to the then kingdom of Saba and Raidan."

After remarking upon the apparent identity of the peoples described as Habasat, Punt, and Kas (Kush), Dr. Glaser says that Habasat strictly means nothing but collectors or gatherers of aromatic roots and gums, in

* 'Die Abessinier in Arabien und Afrika,' by Dr. Edward Glaser. Herman Lukaschik: Munich, 1895.

which capacity they were known to the civilized world, and with whom all dealers in similar commodities were confounded, no matter where they lived, and the name Ethiopian may also sometimes have been used to mean the same. Dr. Glaser's new derivation for the name Ethiopia he bases on the south Arabian word "Tib," or "Taib," found in inscriptions to mean incense trade, the plural of which is *Atjûb*, or *Atiob*. A man who occupied himself with this trade is *Atiobian*. This pure Arabic word he considers has been Hellenized, and the fanciful derivative of "dark complexioned" or sunburnt given to it, and it is curious that of all the dark-complexioned people of Africa, the Ethiopians should be singled out to bear that title.

It is a great pity that the new and interesting information contributed by Dr. Glaser in this book should be given in such a polemical spirit. Prof. D. H. Müller is also an authority on these subjects, and Oriental professor at the University of Vienna; he agrees with Dr. Glaser in the main points, but in others they disagree, and it is not pleasant to find Dr. Glaser alluding to the professor as his "arch enemy" (Hauptfeind), and abusing his country in unguarded terms. Whether his complaints against Dr. Müller and his country are founded or not, the rabid attacks on them which appear on every page can only be looked upon as a great disfigurement to his book.

Dr. Glaser announces that a Munich firm is casting type to correspond with the alphabets of all the different kinds found by him in South Arabia, so that from the printed copy its age can be determined. This type not being ready, and Dr. Glaser declining to use any at present existing, the reader has to put up with his Hebrew transliteration, which is also a great disparagement, and renders criticism of the inscriptions, as they are at present given to the world, impossible.

We can only hope that Dr. Glaser's accuracy with regard to long-vanished ages is greater than it is with regard to events which may be said to have happened under his very eyes, and about which he could easily have obtained first-hand information. The following quotation will illustrate this feature in his work: "The Englishman Theodore Bent, who has for several years travelled with his wife in the countries surrounding the English colonies, in order, as Dellman expressed it in a publication of the Berlin Academy, 'to knit up friendly relations with the chiefs,' after having visited Mashonaland, since become English, went on to East Africa, and in 1892 turned his eyes on Abyssinia, and has since exerted himself to carry the British flag through Arabia. In Abyssinia he rejoiced in the kindest and most willing support of the Italian government, but arrived just at the moment when an Anglo-Italian *entente* for the reconquest of the Sudan was spoken of."

THE ISLAND OF SAKHALIN.*

By Professor von KRASNOW.

By its geological structure, this, the northernmost island of the Japanese group, forms a part rather of Siberia than of Japan. The volcanoes which are such a characteristic feature of Japan are here entirely wanting, and the three parallel chains of mountains which form the skeleton of the island are similar in formation to those of Eastern Siberia. They are composed of Jurassic slate, Cretaceous strata, and Tertiary sandstones, and clothed with thick forests seldom visited even by the native hunters. Inasmuch as the mountains reach in the interior an average elevation of 6000 to 7000 feet, it is evident that the vegetation of the island must be very varied. Still greater differences, however, are caused by the abnormal climatic conditions of the island; for although Sakhalin lies between the latitudes of Trieste and Hamburg, its conditions of life are almost polar. Bathed by two cold marine currents, it is exposed without protection in winter to the cold north-west winds of the East Siberian anticyclone, and an abnormally cold winter is associated with an abnormally cold summer. Even in May snow lies at the sea-level in open sunny spots, whilst in the thick forest it often remains on the ground until June, and in crevices until July. Snowfalls occur down to the end of May, and frosts to the middle of June, the latter beginning again as early as September, at the end of which month snow again falls. On account of the cold currents which bathe the island, distance from the coasts plays an important part in relation to the vegetable covering, giving rise to anomalies perhaps observable on no other portion of the Earth's surface. In Siberia, and even in Central Europe, it has many times been noticed that during the winter cold the mountain summits are much warmer than the plains. There is a saying in the Tirol, "Steigt man im Winter um einen Stock, so wird es warmer um einen Rock." The same holds good in Sakhalin. The cold and heavy winter's air collects in the lower regions, whilst above the mountain heights enjoy the warmer sea-breeze. But since even in summer the cold comes from the surface of the sea, the mountains display all the year through different temperature conditions to those we are accustomed to in Europe. Thus while an arctic vegetation prevails on the sea-shore, forests with sub-tropical Japanese species occur at a certain elevation, and only on the highest summits does the forest again give place to arctic plants.

The principal component element of the forest consists of pines, firs, and Siberian larches—*Pinus ajaniensis*, *Picea Sakhalensis*, and *Larix dahurica*. The young trees grow thickly together, so that in the struggle for existence they kill one another, and but few individuals of a larger size survive. For this reason all the intermediate spaces are filled up with standing or lying skeletons of trees, which make these forests impassable for man. The flora resembles that of North Lapland. On the west side of the island the woods have a more mixed character, especially in the south-west, where the milder climate permits the association of the maple (*Acer spicatum*), *Betula Ermanni*, and large numbers of *Sorbus aucuparia*, with the coniferous trees. At a certain height, especially in the interior of the island, these woods lose their hyperborean character, and quite suddenly sub-tropical forms of the sunny south make their appearance. Beneath the evergreen foliage of the *Taxus baccata* rise high bushes of the Japanese *Ilex crenata*, and stems of bamboo as high as a man—true Indian jungle beneath the conifers of the far north—bush-like *Vaccinium*, fine Hydrangeas, which, as in the evergreen forests of the Himalayas, grace the woods with their blue flowers, whilst colossal leaves of *Araliaceæ* and

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Petasites cover the banks of streams. Only on the highest summits does the forest disappear, and is replaced by dwarf firs—*Cembra pumila*—and evergreen stretches of *Empetrum nigrum*.

Where the sea-shore is flat and exposed to the winds, a regular arctic tundra vegetation prevails. Trees are entirely wanting, or at most form stunted growths, spreading horizontally only, under the shelter of sand-hills. The true tundra region, however, is not on the sea-shore, but in the great longitudinal valleys connected with the structure of the island, especially in those of the Poronai and Tym. With the exception of a few swampy meadows, covered with *Spiræa salicifolia*, these plains form a polar tundra with frozen soil, peat-bogs, and arctic vegetation. In no other part of the world does the tundra-formation extend so far to the south as in Sakhalin, where it occurs under the latitude of Trieste, and where reindeer also are met with in large numbers.

The tundras of these valleys owe their existence, not to the cold winds, but to the unfavourable drainage of the soil. On well-drained soil and on steep mountain slopes no arctic flora grows, but only on the level plains. The nearer we approach such plains from the direction of the mountains, the more does the habit of the woods change. The pines and firs have a stunted appearance, and by degrees disappear altogether, only larches taking their place. The vegetation of the larch woods differ fundamentally from that of the pine forest. It consists of a variety of tundra plants, and possesses much scientific interest from the point of view of the history of the development of the plant world. It is well known that the east coast of Asia, with its chain of islands, has had no glacial epoch: from the equator to the polar regions it enjoys a moist climate, corresponding in the south to that of Tertiary times, and in the north to that of the pre-Glacial epoch. Under the influence of the gradual cooling, the elements of the sub-tropical vegetation which formerly prevailed were but slowly extinguished. Like "living fossils," representatives of this flora, such as *Juglans mandshurica* and *Vitis Thunbergi*, still remain in particularly favourable spots in Sakhalin. But side by side with the extinction of the more southern flora, a gradual conversion of sub-tropical into arctic forms may be observed. In the region of the East Asiatic islands, almost the same evergreen species, belonging to the same families, occur on the high summits of the mountains (*e.g.* on the Javanese volcanoes) and on the border of the polar region; and in this way the plants of the Sakhalin peat-bogs are biologically near allies of the trees of the tropical moist forests. Nothing similar is to be observed in Europe, because here the original vegetation was destroyed by glaciation, and we have now to do only with the subsequently introduced forms.

The peat-formation on the tundras of Sakhalin reaches in many places a thickness of 50 feet, and beneath it upright fossil larch-stems, which have been buried *in situ*, can often be seen. The destruction of these woods might be ascribed to a change of climate. but another explanation may also be found. As was mentioned above, the snow, owing to the cold and gloomy summer, lies as late as July under the shelter of the forest on badly drained clayey soil. The surface, constantly damp, becomes covered with a growth of swamp vegetation, which more and more prevents the access of the summer air and the thawing of the soil. Thus the conditions become more and more unfavourable to the growth of the forest, till even the moisture-loving larch gives place to the bare tundra. All the wide plains of Sakhalin have therefore been transformed into tundras and half-frozen peat-bogs, and a true polar landscape prevails wherever mountains or hills are absent.

A single exception is formed by the banks of streams, which show the sharpest contrast to the tundras, being clothed with the most luxuriant vegetation to be seen anywhere in the island. The appearance of the landscape corresponds to that

of desert regions, where also the courses of streams are fringed with forest. At a distance of a quarter to half a mile, the peat-bog gives place to a charming meadow of *Calamagrostis* grasses, with park-like groups of birches, poplars, willows, *Fraxinus excelsior*, *Ulmus*, etc. But the most striking is the bush vegetation. *Polygonum Sakhalineuse*, *Senecio palmatum*, and other plants, with stems 6 feet or more in height, overtop the traveller, making the use of a hatchet as indispensable as in the tropical forest; and he can scarcely believe, as he sees around him fine tropical butterflies, that he is in the immediate neighbourhood of herds of reindeer and the ever-frozen tundra.

Before the advent of the Russians and Japanese, Sakhalin already possessed four distinct races which had entered the country from the south or west. The most interesting of these are the Gilyaks, who are not becoming extinct like most of the primitive races of North-East Asia, but thrive and maintain their customs and religion. Physically they are true Mongolians, and wear clothes of the Manchu style, with long pigtails like the Chinese, from whom they are distinguished, however, by their more robust physique and darker colour. Their religion consists in a reverence for the unseen spirits of the sea, the woods, and the mountains, to whom offerings of food and the most prized possession of the Gilyaks, tobacco, are made. The bodies of the dead are burnt, and the ashes preserved in special small huts. The women of a clan are the common property of all the men, and, on this account, all the members thereof consider each other as brothers and sisters, fathers and sons. Each family has a summer dwelling to itself, built without a window, of piles and pine logs, and covered with birch bark. The winter dwellings are of the same type, only much larger, and in them all the members of the clan live together. They have no villages, and, beside dogs, they possess no domestic animals. They are a true tribe of fishermen, in contrast to the Tunguses, who live by the rearing of reindeer on the tundras. On the mountains lives the dwindling tribe of hunters called Orochones. Both are nominally Christian, and are few in numbers. There are still Ainos living in the south of the island. Their dress is Japanese, only they wear, like the peasants of Great Russia, shoes of bast. In their customs they are sharply separated from the Ainos of Yesso, the women, *e.g.*, never painting themselves blue mustachios.

In addition to these indigenous races, there are also the Russian exiles, who number about 17,000. Those newly arrived begin by working several years in the coal-mines or in the forests, where they make roads and cut timber. Afterwards they are made to live five years in villages, practising agriculture and cattle-rearing. But as the climatic conditions are very unfavourable to agriculture (in the south only rye, vegetables, and potatoes will grow, oats and fruit-trees flourishing nowhere; while in the north nothing but potatoes and the most northern cereals can be cultivated on exceptionally favourable spots), this village life is still more wretched than that during the period of penal servitude in the mountains. After this the exile becomes free, and is permitted to settle in East Siberia. Every one takes the earliest opportunity of leaving the inhospitable island, and, as a rule, settles in the neighbourhood of Vladivostok. On this account the inhabitants of the villages change every five years, and the advance of cultivation is but slow. Coal-mines, petroleum, and fisheries (as yet in the hands of the Japanese) form the natural riches of the island, which should acquire great importance when the Siberian railway is completed.

THE MONTHLY RECORD.

THE SOCIETY.

The Society's Educational Prizes.—The following candidates for Queen's scholarships, under the Scottish Education Department, were successful at the December examination in obtaining the prizes for proficiency in geography offered by the Society. MALES.—*Prizes of £2 each*: William Forsyth, James Henderson, Alexander D. Morton. *Certificates:* Andrew Shanks, Samuel Wilson, James Downie, Thomas McCririck, James A. Thomson. FEMALES.—*Prizes of £2 each:* Agness Rae, Mary Craig, Elsie Fairweather. *Certificates:* Alice M. Lockhead, Isabella S. Sievwright, Mary E. P. Smith, Mary Walker, Elizabeth Davidson. The medals offered by the Society in connection with the Cambridge Local Examinations, held in December, 1895, were awarded to (Senior candidates) Gertrude Annie Lewis, Ernest Edwin Minns; (Junior candidates) Walter Clement Barker, George Malcolm Young.

EUROPE.

The Evolution of the Baltic.—Professor Rudolf Credner read a paper to the annual meeting of German naturalists and physicians at Lübeck in 1895, on the origin of the Baltic Sea, in which he sketched from geological evidence the changes which that region had undergone down to the present time. He rightly looks upon the present condition of the Baltic as merely a stage in its evolution, and points out that gradual changes in its coast-line are continuously in progress. The original cause of the hollow is shown to be movement of the crust, which, by a series of faults, let down a portion of the surface, consisting of different geological series; but the basin thus formed has been profoundly modified by processes of erosion and accumulation, the result in large measure of ice-action. After the main features of the Baltic were blocked out, many striking changes were brought about by gradual elevation and depression, the history of which is deciphered by the evidence of the fauna of the sea, which was at one time that of salt water, again of brackish water, then of fresh water, and so on, as the rising or falling of the crust brought the general depression more freely into communication with the outer ocean, or restricted or completely cut off its outlet. At present a period of slow elevation seems to be proved by observations on the Scandinavian and Finnish coasts.

Novaya Zemlya.—At the meeting, on January 2, of the Russian Geographical Society, M. Th. Chernyshev gave an account of the geological expedition which visited Novaya Zemlya during the last summer. Having left Archangel on July 22, on board the *Vladimir*, the expedition landed at Matochkin Shar eight days later, explored its coasts, and entered the strait; but it could not reach the Kara Sea on account of ice blocked in the eastern part of the strait. Gribovaya bay and the settlement of Little Karmakuly were next visited and explored, the expedition crossing Novaya Zemlya in the latitude of this last station, and reaching the Kara Sea at Abrosimov bay. It took six days to perform this journey on sledges. Pukhovaya bay and Goose land (Gusinaya Zemlya) were also explored; and on September 21 the expedition was back at Archangel. Surveys and astronomical determinations were made, and also rich geological collections. The chief point of interest is, that proofs have been found of the glaciation of the land during the ice-age, and of its secular raising during recent times—at least, for the southern island of Novaya Zemlya.

Vegetation of the Peloponnesus.—Dr. A. Philippson has, in the twelfth number of *Petermann's Mitteilungen*, 1895, a map of the vegetation of the Peloponnesus, on the scale of 1 : 625,000, showing by different colours the distribution of firs, black pines (*Pinus Laricio*), Aleppo and stone pines (*P. halepensis* and *P. pinea*), oaks, cultivated fields, including ordinary and currant vineyards, cultivated trees (olives, oranges, lemons, etc.), and, under one colour, maquis, phrygana, natural pastures and herbage, and bare tracts. Maquis are dense evergreen scrub; phrygana, small dry prickly shrubs thinly scattered over the surface. The map is based on Dr. Philippson's journeys in 1887–1889. In the text accompanying the map, Dr. Philippson lays stress on the steady destruction of forests, and on the general degradation of the natural vegetation—that is, the displacement of more by less luxuriant forms. The disappearance of the forests he ascribes in a large measure to the characteristics of the Mediterranean climate, which is less favourable to the recovery of devastated forest than that of cooler and moister countries. In the Mediterranean region, with its scorching rainless summers, its mostly violent rains in other seasons, and its rare frosts, the formation of new soil is slower and denudation more rapid than in Central and Northern Europe. Hence when forests are destroyed, bare rocky slopes are exposed, unless maquis succeed in getting a hold before the last of the soil is washed away. When the maquis again are removed, whether by accidental fires or by the action of the charcoal-burners (their great enemy), their place is taken by still more meagre forms—either the stunted kermes oak or the scattered prickly phrygana. This process is still going on, and in Eastern Greece vigorous growths even of maquis are beginning to be rare. When tillage is at once begun on the site of extirpated forests, the course of events is rather different. This helps to protect the soil; but when, as has happened many times in the history of Greece, agriculture is neglected in places for a series of years, the soil gets destroyed with wonderful rapidity. The most destructive period in this respect was probably that of the immigration of the Slavonic pastoral tribes, who only very slowly settled down to arable agriculture. The last catastrophe of this kind was the war of independence in the twenties of the present century. In the plains and in the highlands above 2000 feet, the destruction of soil is not so rapid, but neither in plains nor highlands are the conditions very favourable. In the plains, owing to the destruction of the forests, the rains are more irregular, the supply of moisture less ample, and the rivers more torrential, in consequence of which large areas have become covered with stony detritus. In the mountains, again, though the rains are more frequent even in summer, and in winter there is a covering of snow for a longer or shorter period, still the violence of the rains, the recurrence of long periods of drought, the prevalence at these elevations of limestone rock, and the ubiquitousness of the goat, are all against the restoration of forests once destroyed. The recovery of the soil thus lost is, according to Dr. Philippson, not to be thought of. All the more urgent is the necessity for regulation of the forests and maquis so as to avert further loss.

AFRICA.

An Expedition to the Barotse Country.—Captain Alfred Bertrand, who is a Fellow of our Society, as well as of the Paris and Geneva societies, furnishes the following brief account of an expedition to the Barotse country, under the leadership of Mr. Percy C. Reid, in which he took part: "Our object was to reach the source of the Majili river, an important tributary of the left bank of the Zambezi which had not yet been explored. We left England in March, 1895, and reached Mafeking railway terminus on April 17. Our party consisted of Mr. Percy C. Reid, Mr. Pirie, Captain Gibbons, and myself. We left Mafeking on April 22, and

reached the Zambezi on June 24. Having left our waggons, bullocks, and half the saddle-horses to await our return at Gazuma Veey, where the grass is comparatively good, we crossed the Zambezi at the junction of the Chobe river (called Linyauti or Kuendo by the natives), and reached Kazungula. Captain Gibbons left us here to go to Lialui by water. Our direction was nearly due north, and we had not left the Zambezi for a fortnight before all our saddle-horses had disappeared, including two slaughtered by lions, and we were, therefore, obliged for the future to walk during the whole time. We ascended the Majili river, and reached its source (latitude = 16° 9′ 1″, altitude = 3650 feet) on July 31. Here we were on the watershed of the Zambezi and the Kafukwe river. Since we left Mafeking, Reid had taken over seventy astronomical observations for latitude in forty different positions; I helped him in reading the chronometer when he was using the sextant. Having attained our object, Reid and Pirie decided to return to Kazungula and go along the Chobe river. I decided to walk across the Barotse country as far as Lialui, the residence of King Lewanika; we were to meet later on at Kazungula. At this latitude, the part of the Barotse country lying between the Majili river and the Lumbi river is not known. It is composed of a succession of generally wooded hills intersected by valleys, where flow the tributaries of the three big rivers, Majili, Nzoko, and Lumbi, which run into the Zambezi. On reaching the river Lumbi, I crossed the 'track' which is followed by the missionaries when they go by land to Lialui. The character of the country is different; the hills are not so near each other, and the rivers are less numerous; the most important are the Motondo and the Lui, which unite further southwards and run into the Zambezi. Here and there some large lagoons are to be found, some of them communicating with the Zambezi. After arriving at Lialui, I was very kindly welcomed by the missionaries and by the King Lewanika, who is now under the influence of Christianity. Lewanika, a clever man, gave me interesting particulars about the unknown northern border of his kingdom and its inhabitants. After staying several weeks at Lialui, where I worked as hard as I could, and where I was able to collect much about the Barotse country, Lewanika hired me three native canoes, and I went *viâ* the Zambezi to Kazungula in seventeen days, visiting Nalolo, Sesheke, etc., and going through the splendid region of the rapids between Sesma and Katima-Molilo. As agreed, I met Reid and Pirie at Kazungula, whence we returned by Buluwayo."

Journey to Lake Rukwa.—The account of a journey made by Mr. W. H. Nutt, from Fwambo, the London Missionary Society's station south-east of Lake Tanganyika, to Lake Rukwa (or Rikwa, as Mr. Nutt prefers to spell it), has appeared in the *British Central Africa Gazette* for October 15 and November 1, 1895. In this journey (made about the middle of 1894) the route led north-east through the eastern highlands of Fipa, and struck the lake at some distance from the south end, reached by Sir H. H. Johnston and Dr. Cross in 1889. It thus throws some new light on the imperfectly known hydrography of the lake, and on the features of the surrounding country. Passing at first through a stretch of thin forest, broken occasionally by the rocky beds of wooded streamlets, Mr. Nutt soon reached a more rugged and mountainous country, cut by wild ravines, with ranges running north and south, separated by streamlets flowing to the Saisi, the main feeder of Lake Rukwa from the south-west. Many ruined villages destroyed by the slave-raider Kimaraunga (since driven into his own country by Wissmann) were passed, but near the edge of the plateau small hamlets perched on the hillsides, with a small amount of cultivated ground, were seen. A descent of 1200 feet led from the higher Fipa plateau, but another range of hills had to be crossed before the latter was finally left. From the top of Mount Nakitumbe, some 7000

feet high, a view was obtained over the Rukwa plain and the mountainous country to the north and south, Mount Memya being the most prominent peak in the former direction. A descent of 3000 feet from the normal plateau-level led to the plain, the slopes (down which a foaming torrent descended) producing some of the best African timbers, and swarming with monkeys. The party now struck northwards, following the base of the plateau along a perfectly straight road 6 feet wide made by Kimaraunga when in power here. Since his defeat, the Asukuma have returned to their homes from which he had expelled them. The absence of water and villages to the north-east obliged the traveller to retrace his steps, and a route southwards slightly nearer the lake than that previously followed was chosen. The inhabitants were in a state of great want, the locust plague having passed over their country. The description given of the plain recalls that of its southern portion visited by Johnston. It was a heated level of black fœtid mud baked firm and dry at the time, but inundated during the rains. The Saisi river was crossed, and the Uwanda country entered. The villages are chiefly along the river, in which fishing is carried on by means of weirs and fish-baskets. To the south of the river game abounds, though absent to the north. The lake was reached after a fringe of sedge-grass, coated with an alkaline deposit, had been crossed, which, however, did not reach quite to the water. The immediate shore was absolutely flat and straight, without a single bay, or any bank of stones or sand. The lake, which Mr. Nutt likens to a gigantic mud-hole, is very shallow for some distance from the shore. It is reported to be shrinking from the north and south, and apparently receives few considerable rivers, so that the great evaporation caused by the fierce sun may well exceed the supply of water. The eastern range comes nearer the shore than the western, and Mounts Kiumba and Ilonga, near its south end, presented a broken and romantic appearance. It ends abruptly northwards in Mount Mbutwe. Large flocks of water-fowl were seen, and hippopotamus, crocodiles, and rhinoceros are said to abound. As it proved impossible to proceed southwards, the return was made in the main up the Saisi valley, and the second half of the route cannot have deviated far from that of Sir H. H. Johnston, keeping, however, apparently slightly more to the north, over the southern end of the Fipa plateau, the ascent to which (2400 feet) was made by an easier path than that previously used in the descent.

MM. Nilis and de la Kéthulle on the Borders of Darfur.—Additional information on the country traversed by these explorers (*ante*, p. 203) is given both in the *Bulletin* of the Royal Belgian Geographical Society (1895, No. 6), and in the *Mouvement Géographique* (1896, Nos. 2, 4, 6). The rivers Kotto, Bali, and Shinko have all of them deep and rapid streams, but their upper course is broken by rapids. They flow through a grass-covered plain, dotted over with gentle eminences, and abounding in game, especially elephants. The principal tribes of this region are the Sakkaras, south of 6° N. lat.; the Azandes, or Niam-Niam, east of the Shinko and its tributary the Barrango; and the Bandas, north of 6° and west of the last-named river. One of the many sections of the Azande is that of the Banjias, who are above the middle height, are keen hunters and not cannibals, and very clever in manufacturing pottery and articles in wood and ivory. On the upper Shinko the country completely changed, the river flowing through a rocky mountainous region, connected with the mountain-knot whence spring the Kotto, the Shari, and the Bahr-el-fertit. Some of the ridges rose 1600 to 1900 feet above the level of the plain. The head-streams of the Bali and Kotto having likewise been crossed, the Nile-Congo watershed was reached: and at Katuaka, on the river Ada, in 8° 50′ N. lat., a colony of Darfur people, who had retired towards the south before the Mahdist bands, by which the country to the north is harassed,

was met with. The banks of the Ada were inundated at the time for some distance, and this prevented the travellers from crossing the stream—perhaps a fortunate circumstance, as they afterwards learnt that one of the marauding bands, several thousands strong, had been on the further side at the time. They were thus prevented from visiting the celebrated copper-mines of Hofra-en-Nahas (reached by Colonel Purdy from the north), north-east of which rich iron-mines are likewise reported. The copper is extracted in simple clay furnaces, and round the vein which is worked, great numbers of old abandoned wells are to be seen. The Banda tribes, who inhabit all the region between 6° and 9° N. lat., seem to have inhabited the region from time immemorial, but they are being gradually pushed southwards by pressure from the north. They all speak the same language and follow the same customs, but have no national cohesion among themselves. The population is sparse, the country having suffered much, like other parts of the Sudan, at the hands of the notorious Rabah. The Bandas show much preference for European goods, and are frequently visited by native merchants coming from the north, both from Darfur and the neighbourhood of Lake Chad. A distinct change in the flora was noticeable in the most northern districts visited, the parallel of 6° N. lat. apparently forming the approximate line of partition. North of this the banana and elaïs palm become rare, while gum-acacias begin to appear. The fauna is abundant, and giraffes, rhinoceros, and ostriches are met with on the watershed by travellers from the south. Horses and cattle are also seen north of the same line. The following positions were determined astronomically by Lieut. de la Kéthulle:—

	Latitude N.	Longitude E.
Village of Sango	5° 59′ 26″	24° 28′ 0″
„ Bandassi ...	7° 6′ 36″	24° 32′ 22″
„ Katuaka... ...	8° 45′ 51″	24° 16′ 32″
„ Yangu	6° 2′ 50″	24° 28′ 31″

Kilimanjaro—Meteorology.—Herr Dr. Wildenmann gives (*Mitt. aus den Deutschen Schutzgebieten*, Band viii. Heft 4) a year's observation of rainfall, rainy days, wind, and mean temperature at Moshi (altitude 3770 feet) on Kilimanjaro; attached is a thorough study of the climatology of the mountain. Malarial fever is not at all unusual, and appears to be sometimes due to the clearing of virgin soil; dysentery is very common, probably from the bad drinking-water, and bronchial catarrh is frequent. The author does not consider colonization possible (it must be remembered that the altitude is nearly that of the Shire highlands), and points out that almost every useful plant can be quite as well grown in Usambara. The mean annual temperature was 70° Fahr., the difference between warmest and coldest months about 42° Fahr., and the mean relative humidity of the atmosphere was 66 per cent. There is also a discussion of the effect of the mountain on the rainfall, and particularly in forming the clouds which usually hang upon the upper slopes. This, as well as the hot rainy climate, is against the formation of a sanatorium at this altitude.

Usambara—Ethnology.—Herr Lieut. Storch (*Mitt. aus den Deutschen Schutzgebieten*, Band viii. Heft 4) gives an account of the customs of the Wakilindi, Washambaa, Wapare, Wambuga, and other tribes. The laws, *i.e.* penalties for murder, theft, etc., are detailed; land-tenure, sorcery, slavery, and religion of each of these tribes are treated separately. The Washambaa worship a deity, the spirits of their ancestors and devils. Pythons are considered sacred amongst the Wapare, as are cats amongst apparently all these tribes. The price of a wife varies from three cattle and four goats to one of each. There is also a short vocabulary of Kimbugu. The information is concisely arranged and carefully worked out.

Algeria, Tunis—Influence of Drought on Vegetation.—M. Edmond Gain was instructed to visit Algeria and Tunis in order to investigate this question. His report (*Nouvelles Archives des Missions Scientifiques*, tome vi. pp. 399–423) contains the author's itinerary (Biskra Sfax and Gabes); he suggests the cultivation of the indigenous species of Medicago. He also remarks that the future of Tunis will depend upon its relations with Rhadames and the Sudan.

AUSTRALASIA AND POLYNESIA.

Mount Kinabalu, North Borneo.—Mount Kinabalu, or the "Chinese Widow," is one of the most prominent features on the west coast of British North Borneo. Between 20 and 30 miles from the sea it rises precipitously to 13,698 feet, according to Sir Edward Belcher's triangulation, and so is the loftiest mountain in Malaya. The summit, of eruptive (?) granite, is 2 miles long, bounded by almost vertical walls, save for two ridges, one of which runs to the north-north-east, 10,000 to 11,000 feet high, precipitous, and almost inaccessible, and probably also granitic like the summit itself; and the other in the same line stretches to the south-south-west for many miles, and is composed of sandstone and hard black shale. This latter spur is not so high as the northern one, the height rapidly falling from 11,000 to 8000 feet, and, once clear of the main mountain, the ridge never exceeds 7000 feet, while the Tambunan pass, 30 miles to the north-west, is only 4700 feet. Many spurs stretch from this main spur to the westward, and divide the many streams that join to form the Tampassuk, as their united waters are called in the plains; and the last of this spur is drained by the Sungut. A short account of Dr. Haviland's expedition to Mount Kinabalu in March and April, 1892, has recently been published.* Dr. Haviland was then curator of the museum at Kuching, Sarawak, and his visit to the mountain is of special interest from a botanical point of view. Landing at Gaya, 30 miles from the mountain, he made his way to the mouth of the Tawaran, up which he travelled, and, keeping due east, crossed a ridge rising to 2700 feet between this stream and a tributary from the north, and descended to the Tawaran, which he crossed at 1500 feet to the village of Bongol. This village stands amid pastures grazed by the buffalo, with Pinang palms and coconut trees around. Crossing the ridge to the east at 3100 feet, Dr. Haviland reached the Tampassuk by a steep descent, crossed it at 1500 feet, and followed the east bank to Koung, a village at the foot of the spurs. To the north of Koung is the conical peak of Saduk Saduk, and beyond it the watershed running to the Maripari spur of Kinabalu, between the Pentagaran (Pantaran) and the Kinitaki. The latter river drains some of the precipices of the great mountain, and joins the Dahombang, which receives on the left the Penokok and its tributary the Haiahaia, all of which drain parts of the south-western ridge of Kinabalu and the spurs on the west of it. These rivers join the Kadamaian with a small branch, the Kalupis, in the same valley south-west of Saduk Saduk, the united stream flowing across the plains being called the Tampassuk. The Kadamaian comes from the top of Kinabalu, down the southern slopes to the west of the south-south-western ridge. From Koung Dr. Haviland followed the Tampassuk and the Kadamaian to 2000 feet, climbed 1000 feet to the village of Kiau, and then to the top of the ridge between the Kadamaian and the Penokok (3500 feet), whence a fine view of the precipices of Kinabalu was obtained. He returned to the valley and followed the Kadamaian over very rough ground to 3200 feet, and, keeping eastwards, climbed the now accessible southern slope to

* "On the Flora of Mount Kinabalu, in North Borneo." By O. Stapf, PH.D. *Trans. Linnæan Soc. Lond.*, Dec., 1894, 2nd ser. Botany, vol. iv. part 2, pp. 69–263.

5000 feet, where he camped for a week in the shelter of an overhanging rock. On the road up a magnificent cascade was seen, formed by the Kadamaian rushing down the ridge, 1500 feet of fall being almost perpendicular. The next camp was the same as Mr. Whitehead's at Temburungo, 7750 feet, and the southern spur of Kinabalu was followed further to Pakapaka, where a small cave sheltered the party at 10,450 feet. Only once was 12,000 feet reached. The climate of Kinabalu is equable, but wet even in the driest month. The mornings are usually clear, save for mist low in the valleys, but by nine o'clock a cloud gathers round the mountain, and is as low as 5000 feet by noon. Rain pours, and sometimes hail and sleet, so that the mountain torrents are in high flood; but late in the evening it ceases, and the beds of the torrents are dry before morning. Frosts may occur on the summit, but snow has never been observed. This daily cloud screens the plants from the sun except for the three early morning hours, so that in the west, where the shadow of the mountain then falls, there is practically no insolation. The diffused light, the equable temperature, and the excessive humidity doubtless explain most of the biological peculiarities of the flora, the absence of deeply divided leaves, the scarcity of brilliant flowers, and their prevalent colours of white and red, as well as the large proportion of fleshy fruits. Dr. Stapf, who has studied Dr. Haviland's collections of plants as well as all previous ones from Kinabalu, gives a full description of the specimens, and divides the hill into four floral zones: (1) the zone of plains and low hills, to 3000 feet; (2) the lower mountain zone, from 3000 to 6000 feet; (3) the upper mountain zone, from 6000 to 10,500 feet; and (4) the summit zone above that level. The peculiarities of the flora increase as the mountain is climbed, and the species of the plants found at higher elevations point to a very different distribution of land and water from that existing at present. The conclusions Dr. Stapf draws, based on botanical evidence alone, bear out the theory of the ancient continental nature of South-Eastern Asia and Australia at a period not later than earliest Tertiary times. This was followed by the separation, first of Austral Malaya, then of the Philippines, then of Malaya from Asia, the submergence of Malaya until Borneo and other islands became archipelagos, and a subsequent elevation leading to the formation of the present islands. It is impossible, in a brief notice, to take up all the points raised in Dr. Stapf's important paper, which is well worthy of study.

New Guinea.—The second number of *Petermann's Mitteilungen*, 1895, gives an account of Herr Otto Ehlers' unfortunate expedition across the south-eastern peninsula of the island. It is the first crossing of the island that has been accomplished since 1873, when A. B. Meyer crossed the narrow isthmus between McCluer gulf and Geelvink bay, but has led to no geographical results owing to its disastrous issue. The expedition started from the mouth of the Francisco river, just south of 7° S. on Huron gulf at the east end of the island, under the leadership of Herr Otto Ehlers and M. Piering. It was apparently inadequately equipped, and at the end of two months the provisions were exhausted, and the members of the expedition found themselves in an uninhabited forest, in which apparently not even game was to be met with. At last a considerable river flowing southwards (probably the Arubada) was struck, and the leaders, in order to gain the south coast as quickly as possible, determined to descend it on a raft. Six of the forty-three carriers of the expedition refused to risk themselves on this craft when constructed, and their fears were justified by the event. The raft was somehow destroyed in the current, when the two leaders and twenty-one of the bearers were drowned, and all the collections and notes which they had made were lost along with the entire remaining equipment of the expedition. The sixteen survivors followed the course of the river, and ultimately fell in with some members of a southern tribe who

conducted them to the mission station of Motu-Motu, on the south coast (in 146° 10′ E., about 110 miles in a direct line north-west of New Guinea). The death of Herr Ehlers is a great loss to exploration; he had done excellent work both in Africa and in Eastern Asia. Baron F. von Mueller is said to be planning the despatch of an expedition from Motu Motu into the interior in the reverse direction. That from the north coast, under Messrs. Tappenbeck, Lauterbach, and Kersten, was to start at the end of March.

Dutch New Guinea.—During a reconnaissance along the south coast of New Guinea, made in 1894 by Lieut. H. Velthuyzen of the Dutch navy, the mouth of a large stream named Devinka was discovered, having a breadth of over 1500 yards, and a depth of 3 feet. Although bad weather prevented its exploration, the Dutch commander thinks that the stream should be accessible to light-draught steamers at all times of the year. A survey was also made of the imperfectly known south coast from Prince Henry island to the British boundary (*Petermann's Mitteilungen*, 1895, No. xi.: from the *Jaarboek van de Kon. Nederl. Zeemacht*, 1893–4, pp. 428–452).

The Name Dyak (Dayak).—Mr. H. Ling Roth, in his forthcoming work on 'The Natives of Sarawak and British North Borneo,' dwells at some length on the misuse and the origin of this name. The first known use of the word by a European is in 1780, by Radermacher, who uses it, however, in such a way as to lead to the inference that it was then commonly known in Batavia and the Dutch Indies generally. It came to be applied by Europeans, misled by the somewhat indiscriminate use of the name by the Malays, to all the wild people of Borneo, although, says Sir James Brooke, "the name properly is only applicable to one particular class inhabiting parts of the north-western coast and the mountains of the interior." The present Rajah of Sarawak writes that, while the numerous tribes in the interior of Rejang are called Kayan, "our own more immediate people" are called "*Daya*, or, as more generally known, *Dyak*." Mr. A. Hart Everett states that several tribes use it as the distinctive appellation of their people, and urges that the name should be confined to these, and that a distinguishing prefix should be added in the case of each tribe. Sir James Brooke seems to have been the first to speak of Sea and Land Dyaks, and Mr. Ling Roth adds the curious fact that the Sea Dyaks, who, since the advent of the Europeans, have settled on the Rejang river, have adopted from the Kayans, the original inhabitants of that river, the designation Ivan, or rather, in Dyak pronunciation, Iban. Various interpretations have been given of the name Dyak. The present Rajah of Sarawak states that *Dyak*, or more properly *Dya*, means in many dialects "inland," and this fact may have contributed to the misuse of the word by Europeans; but it would appear to be more probable that the present use of the name is derived from a misunderstanding of the word *dayah*, which in the language of Sarawak (which is in the heart of the Land Dyak country) means "man." Dr. Meyer has pointed out that the terminal *k* is without significance, and Mr. Ling Roth draws attention to the fact that in numerous compound names (like our cabman, boatman, highwayman, etc.) the term *dayah*, as a prefix, however, is used as a generic term for man, as in *dayah berdagang*, "merchant," *dayah takap*, "prisoner," etc. Probably, Mr. Roth thinks, the Malays first, and the Europeans after them, misapprehended this generic term, and applied it as a collective name in a way not known to the people whom they so called.

Fergusson Island, British New Guinea.—Sir Wm. Macgregor, in his last report, states that he has made an expedition across this island from Hughes to Seymour bay (24 miles). He found that the interior is mainly forest, with, however,

patches of rich alluvium. The rocks were for the most part volcanic; three or four small creeks from the foot of Mount Edagwaba "would probably be found to contain gold." Curious ridges apparently of obsidian or pitchstone were noticed near a hill, Bulina (1500 to 1800 feet high). Collections of skulls were found in several of the inland villages, and amongst these was an upper mandible of the hornbill, which does not seem to visit the island, though on the mainland its head is a badge corresponding to the Victoria Cross. The people were on the whole friendly. The climate appeared healthy, and no swamps were noticed.

POLAR REGIONS.

Dr. Nansen's North Polar Expedition.—No further light has, during the past month, been thrown on the rumour with respect to Nansen's Expedition. We are still awaiting information as to the origin of the news which was telegraphed; at present we cannot trace it beyond M. Kandakoff and Kolymsk. Captain Wiggins proposes that a search expedition should be sent by land to Cape Chelyuskin, on the chance of finding any message which may have been left there by the expedition; and another by sea to the New Siberian islands, to discover if Nansen had called there, or if any trace can be found of his return. Baron Toll maintains that the land expedition is impracticable. No harm would be done by sending a vessel into the sea to the north of Siberia to find if there is any trace of the ship, but a formidable search or relief expedition at this stage is unnecessary. If there is any real foundation for the rumour that the expedition has returned, we are sure to receive definite information during the summer. Dr. Nansen promised a friend in London that if he touched at the Siberian coast at all, he would send a communication; as no communication has arrived, the conclusion is that the *Fram* in all probability did not touch the coast.

GENERAL.

Anthropology.—An extremely valuable and learned treatise by Professor Keane will be of great use to English anthropologists who are at present without a satisfactory text-book ('Ethnology:' Cambridge University Press, 1896). The subject is treated in a most liberal manner; the various chapters on man's place in nature, his original habitat, the Ice age and primitive culture, are in reality monographs of these branches of anthropology, in which a mass of detailed information is clearly and concisely discussed. Language and the physical criteria of race are exhaustively treated, and the author, after reviewing other classifications of man, divides the human species into four main groups which are practically those of Linnæus. Each group is discussed in a special chapter with a genealogical tree and photographic reproductions of the more important types. There are also many other illustrations of skulls, dolmens, palæolithic and neolithic implements. As a sound introduction to ethnology, the work will be extremely valuable to all travellers and residents in savage places, as it is both compact, full of details, and yet, strangely enough, extremely readable. The pedigrees of the various groups, *Homo caucasicus*, etc., will be vigorously criticized, but they undoubtedly assist in giving a clear idea of race distribution. It appears somewhat rash to say that "without miscegenation" (with yellow races) "the negro has no future," though, of course, few will deny that he cannot or has not advanced without extraneous aid. There are other somewhat startling ideas of a similar nature, but gratitude in the possession of such a mine of information, carefully and clearly treated, much outweighs all other considerations, and this book will probably become a standard English classic on the subject.

Geography in Education.—No. 1, Vol. xxvii. (1895) of the Bulletin of the *American Geographical Society* contains an abstract, by Mr. Israel C. Russell, of the University of Michigan, of the reports of a conference on geography held at Chicago in December, 1892. The conference was organized by a "committee of ten," appointed by the National Education Association in that year to consider the general subject of uniformity in school programmes and in requirements for admission to college, the members taking part in the conference being ten representatives (of whom Mr. Russell was one) selected from instructors in schools and colleges. The reports were first published by the U.S. Bureau of Education (Washington, D.C., 1893), and afterwards for the National Educational Association by the American Book Company under the title of 'Report of the Committee of Ten on Secondary School Studies,' with the Reports of the Conferences arranged by the Committee (New York, 1894). On Geography, two reports are published, a minority report having been sent in by one of the members of the conference. The members signing the majority report, without apparently making any attempt to define geography, direct special attention to five phases of the subject which they designate respectively as elementary geography, physical geography, physiography, meteorology, and geology. These they define partly with reference to the stage of school or college teaching to which they correspond. Physiography, for example, is distinguished from physical geography as "a more advanced treatment of our physical environment . . . to be pursued in the later high school or early college years." This, however, is one of the points to which the minority report takes exception, objecting to the use of the term physiography altogether on account of the indefiniteness of the word as now used by various authors. The majority report also urges strongly upon teachers the importance of using geography as a means of developing three classes of mental activities: the power to observe, the power of scientific imagination, and the power of reasoning; and, with reference to the cultivation of these faculties, treats of the whole subject of geographical teaching under four aspects: (1) Observational geography (what is commonly known as *Heimatskunde*); (2) representative geography (teaching the use of sketches, maps, models, etc.); (3) descriptive geography; and (4) rational geography—under which head attention is principally directed to the changes wrought in a landscape by forces acting through long ranges of time. Great stress is laid on the importance of placing good topographical maps in the hands of students, and, with a view to this, the conference appointed a committee to consider in what way the maps issued by various government and state surveys might be made available for school use. The result was the publication of a report by this committee on 'The Use of Government Maps in Schools' (New York: Henry Holt & Co., price 34 cents), in which descriptions are given of over fifty phases of relief that are well illustrated by maps which can be had by teachers, either free of charge or for a nominal sum. Outlines of methods of instruction in various grades are suggested. A good deal of space is taken up with illustrations of the scope of physiography as understood by the writers of the report, and it is contended that a comparison of the outline given under this head with the table of contents in the "classic works on geography by Ritter, Humboldt, and Guyot," shows that "a new element has been introduced into the science by the modern school. Rational geography has supplanted mere description."

Spelæological Society.—Last year a new scientific society was formed in Paris for the study of a branch of geography which has recently been greatly advanced by M. E. A. Martel, the general secretary of the new association. The Bulletin of the Society, issued quarterly, is called *Spelunca*. The first article of the statutes thus defines the objects pursued: "The Spelæological

Society has been founded in order to ensure the exploration, to facilitate the general study, and to aid in the regulation or utilization of all kinds of subterranean cavities, known or unknown, natural or artificial; to encourage and give grants towards investigations bearing in any way on caverns; and to popularize and develop researches of every kind into the interior of the Earth from the practical as well as the theoretical, the utilitarian as well as the scientific, standpoints." Incidentally, it is interesting to notice that this scientific society is licensed by the police, has to announce each meeting to the police, and is under penalty to discuss at its meetings spelæology alone.

The Ivory Trade in 1895.—The *Mouvement Géographique* (1896, No. 2) again publishes an annual summary of the ivory trade (cf. *Journal*, vol. v. p. 273), from which it appears that the importance of Antwerp as a market for this article goes on increasing, while the quantities sold in London and Liverpool show a further decline in 1895, as compared with the previous year. Excluding old stock on hand, the amounts offered for sale were respectively 268, 263, and 53 tons, although, including old stock, London still stood at the head of the list. As regards the place of origin, the amount exported from the Congo State reached in 1895 the largest figure on record, far exceeding that from any other part of Africa, and appears to include some from the Sudan, which can no longer reach Egypt. The amount from the East Coast has again diminished, the death of Mr. Stokes having added another cause of decrease to those previously in operation.

Captain Cook's Earliest Monument.—Sir Erasmus Ommanney calls our attention to an article by Mr. W. H. Traill in the *Brisbane Courier* for January 3 last, giving an account of the first monument erected in honour of Captain Cook, which, strange to say, was not in his own country, but in France, and has apparently escaped the notice of his biographers. It was erected, from the designs of M. Pajou, by M. de Laborde (afterwards a victim of the French Revolution), who showed a warm appreciation of the merits of the English navigator, in his park of Mereville, where also exists a monument to the memory of M. de Laborde's two sons, who lost their lives when taking part in the voyage of La Pérouse in 1786, or eight years after the death of Cook.

The Geography of Mammals. No. IV.—In this paper, in the March number, pp. 282, 283, the tropic of *Capricorn* has by inadvertence been named instead of the tropic of *Cancer*.

OBITUARY.

Cristoforo Negri.

Cavaliere Cristoforo Negri, whose death was recently announced, was a distinguished Italian scientist and Minister of State, and for many years the most enthusiastic promoter of geographical research that Italy has seen. Born at Padua in 1809, he first devoted himself to the study of law at Pavia, Gratz, and Vienna. For seven years he held the post of Professor of Constitutional Law at Padua, but, owing to the prominent part he took in the political movements of 1848, he was compelled to leave that city and remove to Turin, where he soon attained the dignity of Rector of the University. He was subsequently appointed chief of the Consular Department in the Italian Ministry of Foreign Affairs, and in the course of his official duties visited England, Russia, and other countries, where his reputation and popularity won him a large circle of friends and admirers. He was the founder, in 1866, and first President of the Italian Geographical Society, the

meetings of which were first held in Florence, and then transferred to Rome. This body, under Negri's auspices, granted aid to the German Polar expedition and to the Italian expedition to Southern Africa, and amongst the recipients of its gold medals was Colonel, afterwards Sir Henry, Yule. It was through Negri's representation and influence that Lieut. Eugenio Parent, of the Italian navy, was attached to the Swedish Arctic expedition of 1872, and Lieut. Giacomo Bove to Professor Nordenskiold's expedition in quest of the North-East Passage. Cavaliere Negri was also a strong supporter of Antarctic exploration, and, indeed, most of the foremost geographical undertakings of the day. He had for many years been an Honorary Corresponding Member of the Royal Geographical Society.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1895-96.

Seventh Ordinary Meeting, February 24, 1896.—CLEMENTS R. MARKHAM, ESQ., C.B., President, in the Chair.

ELECTIONS.—*Louis Charles Alexander, LL.D.; Alfred Davidson Asgill; Hon. David Wynford Carnegie; W. A. L. Fletcher; William Harris; John McCleeland Henderson, Ph.D.; Lionel F. Levenux; Lieut.-Colonel G. E. Money; Arthur Llewellyn Pearse; Charles Wooliey.*

The PRESIDENT said: Before commencing the business of the evening, I must allude to the news lately received about Nansen's expedition. In answer to a telegram, Mr. Gregoriev, the Secretary of the Imperial Russian Geographical Society, has written me a letter, in which he states that when the telegram arrived from Irkutsk at St. Petersburg, the governor-general of Eastern Siberia, General Gorunzkine, happened to be there. He said that Kuchnaroff, mentioned in the telegram, was a merchant of Yakutsk, trading in the Kolyma district, and that Kondakoff, also mentioned, is the head of the Kolyma government. The governor-general did not believe the news to be true, because, if it had been, Kondakoff would certainly have sent it to the governor of Yakutsk, who would at once have telegraphed to General Gorunzkine. On February 14, the governor-general sent a telegram to the governor of Yakutsk, but the telegraph line ends at Kirinsk, whence the post takes twelve days to go to Yakutsk, and twelve days back. Mr. Gregoriev also telegraphed for a *verbatim* account of what appeared in the local newspaper. *Vostochnoe Obosrinie*. The governor-general does not believe the news, nor do Baron Osten Saken nor Mr. Gregoriev. A reply from Yakutsk may be expected about March 10; meanwhile, we can only hope to have some news of Nansen, and of his gallant companions, and trust that they are quite safe, this being their third winter.

We have also received a letter from Colonel Trotter, a member of our Council, now serving on the Joint Commission for the delimitation of the colony of Sierra Leone. Colonel Trotter reports that he has reached the source of the Niger, a spring from which a small stream issues. He gives an interesting account of the scenery, and I trust, when he returns, we shall have a paper from him. I heard another interesting piece of news this afternoon from Admiral Wharton, viz. that one of his surveying ships has obtained the deepest sea-sounding ever made. The deepest ever made before was by the *Tuscarora*, 4675 fathoms, near Japan: but the *Penguin* has made a sounding much deeper near the Tonga island. Before calling upon Mr. Littledale, I must refer to the great loss the Society has sustained in the death of that illustrious geographer, General James Walker. In the Council his loss will be much felt, and will for a long time be irreparable. He will be specially missed on

such an occasion as the present, for his profound knowledge of the geography of Central Asia was always at our service. On his public services, and on his high scientific attainments, I will not dwell here; it has been my duty to do so in our *Journal*, but I could not allow this opportunity to pass without referring to the loss this Society has sustained by the death of our lamented friend. I have also to announce the death of Signor Cristoforo Negri, founder of the Italian Geographical Society, who was very active as a geographer thirty years ago, and is well known to those who can remember that time. We have also lost the Rev. Horace Waller, a companion of Livingstone in the Zambesi region, who so frequently joined in our discussions, and gave us much interesting information when papers regarding that part of the world were read.

The Paper read was:—

"A Journey across Tibet from North to South." By St. George R. Littledale, Esq.

Eighth Ordinary Meeting, March 9, 1896.—CLEMENTS R. MARKHAM, ESQ., C.B., President, in the Chair.

ELECTIONS.—*Ford Gurney Barclay; Lord Castleton; Charles Grugeon; Count Ernest Hoyos; Count Stanislas Ostrórog; George Stewart; Philip Vander Byl.*

The PRESIDENT said: A very important journey has recently been made from China to Assam by Prince Henry of Orléans, and two companions, and I am glad to say that His Royal Highness has almost promised to read us a paper, and give us an account of his very remarkable journey on one of the Mondays in April. We have also had news of a geographical feat having been performed in the Barotse country, in Africa, when several of the upper feeders of the Zambesi have been crossed by Mr. Reid and Captains Gibbons and Bertrand. They have done exceedingly good work, and mapped the country. Turning to domestic matters, the Council has been anxious to make the council-room more pleasant for Fellows who desire to come to read and make researches; they have ordered a fire to be always lighted, have shortened the table, and sanctioned the purchase of two very comfortable armchairs.

The Paper read was:—

"On the Country of the Shans." By Colonel R. G. Woodthorpe, C.B., R.E.

Afternoon Technical Meeting, Friday, March 9, 1896.—CLEMENTS R. MARKHAM, Esq., C.B., F.R.S., President, in the Chair.

The Paper read was:—

"A Plan for the Geographical Description of the British Islands on the Basis of the Ordnance Survey." By Hugh Robert Mill, D.Sc., F.R.S.E.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., *Librarian*, R.G.S.

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce, Commercial.
C. R. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
J. = Journal.
M. = Mitteilungen.
Mag. = Magazine.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue, Revista.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

EUROPE.

Austria—Bosnia and Herzegovina. **Ballif.**

Wasserbauten in Bosnien und der Hercegovina. I. Theil. Meliorationsarbeiten und Cisternen im Karstgebiete. Dargestellt von Philipp Ballif. Herausgegeben von der Bosn.-Herceg. Landesregierung. Wien: A Holzhausen, 1896. Size 11½ × 8, pp. 92. *Maps and Plates. Presented by M. H. Moser.*

The works carried out by the Government of Bosnia-Herzegovina in the way of improving the water-supply in the Karst district are treated in detail in this Report, with a number of large-scale maps beautifully executed. The problem is to distribute water over the surface of a country the natural circulation of which is largely underground. It involves the construction of canals and cisterns, and the "regulation" of springs and sink-holes

Austria—Bosnia-Herzegovina. **Meteorology.**

Ergebnisse der Meteorologischen Beobachtungen der Landesstationen in Bosnien-Hercegovina im Jahre, 1894. Herausgegeben von der Bosnisch-Hercegovinischen Landesregierung. Wien, 1895. Size 12½ × 9½, pp. xii. and 112. *Map, Diagrams, etc. Presented by M. H. Moser.*

These statistics convey further evidence of the enlightened action of the Bosnia-Herzegovina Government in studying the physical geography of these provinces.

Austria—Geographical Work. *M.G. Ges. Wien* **38** (1895): 674–691.

Bericht über die Leistungen der österreichischen Staatsinstitute und Vereine auf dem Gebiete der geographischen und verwandten Wissenschaften im Jahre 1894.

Gives an account of the work of the Military Geographical Institute, the Geological Survey, the Statistical Department of the Ministry of Commerce, the Meteorological and Magnetic Institute, the Scientific Exploration of Bohemia, and the German and Austrian Alpine Club.

Channel Islands. *Le Globe, B.S.G. Genève* **35** (1896): 43–56. **Chaix.**

Les côtes des Iles Normandes de la Manche. Par M. le Prof. Ém. Chaix.

Danube. **Lorenz-Liburnau.**

Donau-Studien. Nach dem Plane und den Instructionen von Dr. Jos. Ritter v. Lorenz-Liburnau. Vierte Abhandlung. Beilage zu Band xxxviii. (1895) der M. G. Ges. Wien. Vienna, 1895. Size 9 × 6½, pp. iv. and 116.

This section deals with the rate of the current in the Danube between Passau and Galatz, by comparing the speed of steamers going up and down stream.

Færoes. **Grossmann.**

The Færoes. By Karl Grossmann, M.D. From the *Geographical Journal* for January, 1896. Size 10 × 6½, pp. 24. *Map and Illustrations.*

France. *B. Union G. Nord de la France* **15** (1894): 216–240; **16** (1895): 1–64. **Gilles.**

Le bassin houiller du Nord et du Pas-de-Calais. Par M. Gilles.

France—Gard. *Spelunca* **1** (1895): 87–97. **Mazauric.**

Les cavernes de la Boudène au Mas Cabanis, commune de Roquedur (Gard). Par M. Félix Mazauric à Nimes. *With Plans.*

France—Jura. *Spelunca* **1** (1895): 115–128. **Chevrot and Corcelle.**

Première exploration du Gouffre de Pierrefeu (Jura). Par M. le Dr. Chevrot. Grottes du Jura meridional (Autour de Culoz). Par M. J. Corcelle. *With Illustrations.*

France—Marseilles. *C.R.* **122** (1896): 209–213 **Vasseur and Fournier.**

Preuves de l'extension sous-marine, au sud de Marseille, du massif ancien des Maures et de l'Esterel. Note de MM. Vasseur, et E. Fournier. *With Map.*

Germany—Norderney. **Verhoeff.**

Nova Acta K. Leop.-Carol. Deutschen A. Naturforscher **61** (1894): 45–216.

Blumen und Insekten der Insel Norderney und ihre Wechselbeziehungen, ein Beitrag zur Insekten-Blumenlehre und zur Erkenntniss biologischer und geographischer Erscheinungen auf den deutschen Nordseeinseln. Von C. Verhoeff. *With Plates.*

Germany—Rainfall. **Moldenhauer.**

Die geographische Verteilung der Niederschläge im nordwestlichen Deutschland. Von Dr. Paul Moldenhauer in Kiel.—Forschungen zur deutschen Landes- und Volkskunde . . . herausgegeben von Dr. A. Kirchhoff. Neunter Band. Heft 5. Stuttgart: J. Engelhorn, 1896 Size 9½ × 6½, pp. [68]. *Map.*

Greece. *Z. Ges. Erdk. Berlin* **30** (1895): 417–498. **Philippson.**

Reisen und Forschungen in Nord-Griechenland. Von Dr. Alfred Philippson. II. Teil. *With Map and Profiles.*

Hungary—Huzuls. *Globus* **69** (1896): 69–74, 90–95. **Kaindl.**

Neue Beiträge zur Ethnologie und Volkskunde der Huzulen. Von Dr. Raimund Friedrich Kaindl, Czernowitz. *With Illustrations.*

Italy—Pontine Marshes. **Donat.**

The Pontine Marshes. A lecture delivered at the Geographical Society of Berlin. By F. M. von Donat. Translated from the *Proceedings of the Berlin Geographical Society. With Map.* London: S. Sidders, 1895. Size 8½ × 5½, pp. 16. *Presented by the Author.*

Deals with the methods and results of draining the Pontine marshes, and combating the endemic fever of the district.

Malta. *J.R. Colonial I.* **27** (1896): 176–180. **Bedford.**

Malta and the Maltese Race. By the Rev. W. K. R Bedford. [Abstract.]

Norway—Anthropology. *Ymer* **14** (1894): 165–186. **Arbo.**

Udsigt over det sydvestlige Norges anthropologiske forhold. Ved Brigadelæge C. O. E. Arbo.

Norway—Varanger Fiord. *Nature* **53** (1896): 417–418. **Reusch.**

The Varangerfjord Region and the Forthcoming Solar Eclipse. By Hans Reusch. *With Illustration.*

Portugal. *B.S.G. Lisboa* **14** (1895): 385–402. **Choffat.**

Promenade au Gerez. Souvenirs d'un géologue. Par Paul Choffat.

Portugal—Historical *B.S.G. Lisbon,* **14** (1895): 741–775. **Dozy.**

Vesperas do Centenario. O cerco de Santarem, 1184. Segundo os documentos Arabes. Por R. Dozy, traducção de Luciano Cordeiro.

Portugal—Oporto. **Menéres.**

Relatorio dos Actos da Direcção da Associação Commercial do Porto no anno de 1895 elaborado pelo 1° Secretario Alfredo da Fonseca Menéres e apresentado á assembleia geral, em sessão de 15 de Janeiro de 1896. Porto: Typ. do "Commercio do Porto," 1896. Size 9 × 6½, pp. 134 and 168. *Presented by the Compiler.*

Russia. *National G. Mag.* **7** (1896): 3–26. **Hubbard.**

Russia in Europe. By Hon. Gardiner G. Hubbard, LL.D. *With Map.*

Russia—Kolgueff Island. **Feilden.**

Notes on the Glacial Geology of Arctic Europe and its Islands. Part I.: Kolguev Island. By Colonel H. W. Feilden. With an Appendix by Prof. T. G. Bonney. [From the *Quarterly Journal of the Geological Society* for February, 1896, vol lii.] Size 8½ × 5½, pp. [16]. *Presented by Colonel Feilden.*

A paper communicated to the Geological Society.

Servia—Douboca Caves. *Spelunca* **1** (1895): 81–87. **Cvijić.**

La grande grotte de Douboca, dans la Serbie orientale. Par M. le Dr J. Cvijic. *With Plan.*

Spain. **Wegener.**

Herbsttage in Andalusien. Von Georg Wegener. Zweite Auflage. Berlin: Allgemeiner Verein für Deutsche Litteratur, 1895. Size 9 × 6, pp. 322. *Illustrations.* *Presented by the Publisher.*

A popular description of a visit to Spain and the coast of Marocco, with numerous good illustrations.

Switzerland. ———

Annuaire Statistique de la Suisse. Publié par le Bureau de Statistique du Département Fédéral de l'Intérieur. Cinquième Année, 1895. Bern, 1896. Size 10 × 6½, pp. xviii. and 408.

Turkey—Constantinople. *J.S. Arts* **44** (1896): 351–357. **Davey.**

Stamboul: Old and New. By Richard Davey.

Turkey—Railways. *M.G. Ges. Hamburg* **11** (1896): 41–61. **Heintze.**

Eisenbahnen in der Türkei. Von W. Heintze.

This article gives an account of the railways of the Turkish empire, from which it appears that at present there are 920 miles of railway in European Turkey and 940 miles in Asiatic Turkey.

ASIA.

Armenian Question. *Contemporary Rev.* (1896): 270–276. **Lynch.**

The Armenian Question: Europe or Russia? By H. F. B. Lynch.

Asiatic Turkey, etc. *Petermanns M.* **42** (1896): 1–10. **Selenoy and Seidlitz.**

Die Verbreitung der Armenier in der asiatischen Türkei und in Transkaukasien. Nach General-leutnant G. L. Selenoy und N. v. Seidlitz *With Map.*

This was noticed in the *Journal* for March, vol. vii. p. 312.

Central Asia. *Scottish G. Mag.* **12** (1896): 75–87. **Obruchef.**

The Orography of Central Asia and its South-Eastern Borderlands. [Abstract from article by M. Obruchef in the *Izvestiya* of the Russian Geographical Society, No. iii., 1895.]

China and France. ———

No. 1615. Chambre des Députés. Sixième Législature. Session extraordinaire de 1895. Projet de Loi portant approbation des Conventions de délimitation et de commerce signées à Pékin, le 20 juin 1895, entre la France et la Chine, présenté . . . par M. Berthelot, et par M. Guieysse. [Paris.] Size 11½ × 9, pp. 14.

China—Mongolia. *Scottish G. Mag.* **12** (1896): 57–68. **Markoff.**

The Towns of Northern Mongolia. By Dr. Anatolius Markoff.

China—Shantung. **Armstrong.**

In a Mule Litter to the Tomb of Confucius. By Alex. Armstrong. London: J. Nisbet & Co., 1896. Size 7½ × 5½, pp. viii. and 148. *Illustrations.* *Price 2s. 6d.* *Presented by the Publishers.*

A simply written narrative of a missionary's journey in the province of Shantung.

China—Trade. *M.G. Ges. Hamburg* **11** (1896): 80–95. **Markoff.**

Der zukünftige Handel Chinas. Von Dr. Anatol Markoff.

Eastern Asia. **Curzon.**

Problems of the Far East. By the Right Hon. George N. Curzon, M.P. Japan —Korea—China. New and Revised Edition. Westminster: A. Constable & Co., 1896. Size 9 × 6, pp. xxiv. and 444. *Maps and Illustrations.* *Price 7s. 6d.* *Presented by the Publishers.*

This new edition is revised in the light of the results of the war between China and Japan, but, as the Author points out in his preface, the fact that this war justified his predictions has made the amount of revision requisite comparatively slight.

India. *J. United Service I. India* **24** (1895): 369–391. **Neville.**

Gold Medal Prize Essay for 1895. Six Tactical Problems, with solutions applicable to India (with six Maps). By Lieut.-Colonel J. P. C. Neville.

India. *B. American G.S.* **27** (1895): 360–372. **Wilson.**

Topography and Scenery of Northern India. A Lecture by Herbert M. Wilson.

India—Boundary. **Holdich.**

Preliminary report of the operations of the Survey detachment . . . in connection with the Pamir Boundary Delimitation. From Colonel T. H. Holdich. Size 13½ × 8½, pp. 6. *Presented by the Secretary of State for India.*

India—Himalaya. *M.G. Ges. Wien* **39** (1896): 1–35. **Diener.**

Die Eiszeit im Himalaya. Von Dr. Carl Diener (in Wien).

India—Himalayas. **McCormick.**

An Artist in the Himalayas. By A. D. McCormick. Illustrated by over 100 original sketches made on the journey. London: T. Fisher Unwin, 1895. Size 9 × 6, pp. xii. and 306. *Portrait and Map. Price* 16*s.*

Mr. McCormick accompanied Sir W. M. Conway in his Karakoram journey, and this book gives his impressions by the way in words and sketches.

India—Kashmir. *Alpine J.* **18** (1896): 17–32. **Collie.**

Climbing on the Nanga Parbat Range, Kashmir. By J. Norman Collie. *With Two Illustrations.*

India—Kashmir. *J.E. India Assoc.* **27** (1896): 22–32. **Lawrence.**

Kashmir. By Walter R. Lawrence.

India—Punjab. *J.S. Arts* **44** (1896): 285–304. **Lyall.**

Punjab Irrigation: Ancient and Modern. By Sir James Broadwood Lyall.

India—Punjab—Rawalpindi. ———

Gazetteer of the Rawalpindi District. Revised Edition, 1893–94. Compiled and Published by Authority of the Punjab Government. Lahore, 1895. Size 10 × 7, pp. x., 268, and lx. *Map. Presented by the Secretary of State for India.*

India—Shan Hills. *J.S. Arts* **44** (1896): 197–210. **Woodthorpe.**

The Shan Hills: their Peoples and Products. By Col. R. G. Woodthorpe.

Japan. *Trans. Asiatic S. Japan* **23** (1895): 91–116. **Mac Cauley.**

The Japanese Landscape. By Clay Mac Cauley.

A consideration of Japanese scenery in the light of the geographical, geological, and climatic conditions on the islands, explaining the individual character of it, and analyzing its æsthetic value.

Japan—Meteorology. **Knipping**

Nova Acta K. Leop.-Carol. Deutschen A. Naturforscher **61** (1894): 217–288.

Die jährliche Periode der mittleren Richtung der Winde, unteren und oberen Luftströmungen in Japan. Von Erwin Knipping. *With Plates.*

Japan—Petroleum. *Trans. Asiatic S. Japan* **23** (1895): 75–90. **Newell.**

The Petroleum Industries at Nagaoka. By Horatio B. Newell.

Japanese Art. **Rein.**

Oesterreichische Monatssch. Orient **20** (1894): 97–102; **21** (1895): 21–31, 121–129.

Fortentwicklung und Wandlungen des japanischen Kunstgewerbes während der letzten zwanzig Jahre. Von J. Rein.

Khiva. *Globus* **69** (1896): 142–145. **Vambéry.**

Bilder aus Chiwa. Von H. Vambéry. *With Illustrations.*

The illustrations include a portrait of the Khan of Khiva and views of the town.

Luchuan Language. **Chamberlain.**

Essay in aid of a Grammar and Dictionary of the Luchuan Language. By Basil Hall Chamberlain. [Published by the Asiatic Society of Japan as a Supplement to vol. xxiii. of its *Transactions.*] Yokohama, etc.: Kelly and Walsh, 1895. Size 9½ × 6, pp. 272. *Presented by the Asiatic Society of Japan.*

Malay Archipelago. **Gennep.**

Bijd. Taal-, Land- en Volkenk. Ned.-Indie (6) **2** (1896): 89–108.

Bijdrage tot de Kennis van den Kangéan-Archipel. Medegedeeld door J. L. van Gennep. *With Map.*

Malay Archipelago—Borneo. **Kühr**

Bijd. Taal,- Land- en Volkenk. Ned.-Indie (6) **2** (1896): 63–88.

Schetsen uit Borneo's Westerafdeeling. Door E. L. M. Kühr. *With Illustrations.*

Palestine. *Palestine Exploration Fund, Q. Statement* (1896): 24–47. **Hill.**
A Journey East of the Jordan and the Dead Sea, 1895. By Gray Hill. *With Illustrations.*

Persia. **Vaughan.**
Journeys in Persia (1890–91). By Captain H. B. Vaughan. From the *Geographical Journal* for January and February, 1896. Size 10 × 6½, pp. 32. *Map.*

Sakhalin. *Verh. Ges. Erdk. Berlin* **23** (1896): 58–68. **Krassnow.**
Herr Professor v. Krassnow: Beobachtungen aus dem Gebiet der nordostasiatischen Inselwelt.
This article is specially summarized in the *Journal.*

AFRICA.

Abyssinia. *Oesterreichische Monatssch. Orient* **21** (1895): 129–132. **Paulitschke.**
Die heutige Lage der Italiener in Abessinien. Von Professor Dr. Philipp Paulitschke.

Africa. **Götzen.**
Durch Afrika von Ost nach West. Resultate und Begebenheiten einer Reise von der Deutschostafrikanischen Küste bis zur Kongomündung in den Jahren 1893–94. Von G. A. Graf von Götzen. Berlin: D. Reimer, 1895. Size 12½ × 8½, pp. xii. and 418. *Maps and Illustrations. Presented by the Publishers.*
The journey described in this splendidly got up book was reported in the *Journal*, vol. v. (1895), pp. 354–360.

Algeria—Ostrich-rearing. **Forest.**
B. and Mém. S. Africaine de France (1895): 152–180, 211–253, 271–291.
L'autruche de Barbarie. Par J. Forest aîné.

British West Africa—Ashanti. ———
Gold Coast. Further Correspondence relating to Affairs in Ashanti. [C.—7917.] London: Eyre and Spottiswoode, 1896. Size 13½ × 8½, pp. xii. and 240. *Price* 2*s.* Ditto (in continuation). [C.—7918.] London: Eyre and Spottiswoode, 1896. Size 13½ × 8½, pp. xiv. and 150. *Price* 1*s.* 4*d.*

Central Africa—Partition Treaties. **Schirmer.**
H. Schirmer. Les Traités de Partage de 1894 en Afrique Centrale (Extrait des *Annales de Géographie*) (Nos. 17, du 15 juillet 1895 et 20, du 15 Janvier 1896). Paris: A. Colin & Co. Size 10 × 6½, pp. [36]. *Maps. Presented by the Author.*

Congo. *B.S. d'Études coloniales* **2** (1895): 301–391. **Meuleman.**
Étude sur l'élevage des animaux domestiques au Congo. Par E. Meuleman. *With Illustration.*

Eastern Sudan. **Slatin.**
Fire and Sword in the Sudan. A Personal Narrative of Fighting and Serving the Dervishes, 1879–1895. By Rudolf C. Slatin Pasha, C.B. Translated by Major J. R. Wingate, C.B., etc., London: E. Arnold, 1896. Size 10 × 6½, pp. xx. and 636. *Portrait, Map, Plan, and Illustrations. Price* 21*s. Presented by the Publisher.*
This will be specially noticed.

French Congo—Sanga. *Mouvement G.* **13** (1896): 55–60. **Wauters.**
La Rivière Sanga. Par A. J. Wauters. *With Map.*

French West Africa. *B.S.G. Commerc. Paris* **18** (1896): 11–20. **Toutée.**
Par le Dahomey et le Niger moyen au Sahara français. Par M. le Capitaine Toutée. *With Map.*

German Colonies. ———
Weissbuch. Sechszehnter Theil. Berlin: Carl Heymanns Verlag, 1896. Size 12 × 8½, pp. 240.
This contains the annual reports on the development of Togo, the Cameroons, and German East and South-West Africa, and also includes the recent official correspondence relating to the South African Republic.

German East Africa **Meinecke.**
Aus dem Lande der Suaheli. Teil I. Reisebriefe und Zuckeruntersuchungen am Pangani, von Gustav Meinecke. Vegetationsbilder von Dr. Otto Warburg.

Berlin: Deutscher Kolonial-Verlag (G. Meinecke), 1895. Size 10 × 6½, pp. 194. *Map and Illustrations.*

An interesting series of letters from the East Coast of Africa, describing the land, people, and products of the German sphere of influence, and illustrated by a selection of views and pictures of plants of quite unusual excellence.

German West Africa—Togo. *Petermanns M.* **42** (1896): 11–20, 29–33. **Conradt.**

Das Hinterland der deutschen Kolonie Togo. Von L. Conradt.

German West Africa—Cameroons. *Ymer* **14** (1894): 65–120. **Dusén.**

Om Kamerunområdet. Af. P. Dusén. *With Map and Illustrations.*

Italian Possessions in Africa. ———

Possessi e Protettorati in Africa. Estratto dall' *Annuario Statistico Italiano*, 1894. [Rome, 1896.] Size 10½ × 7½, pp. 50.

Madagascar. **Spielmann.**

Aus allen Welttheilen **27** (1895): 49–54, 119–124; (1896): 153–158, 177–182.

Madagascar. Von Dr. C. Spielmann.

Madagascar—Antananarivo Annual. **Sibree and Baron.**

The Antananarivo Annual and Madagascar Magazine. Edited by the Rev. J. Sibree and Rev. R. Baron. No. xix. Christmas, 1895 (Part iii. of vol. v.). Antananarivo. London: J. Haddon & Co., 1895. Size 8½ × 5½, pp. iv. and [128]. *Map. Presented by the Rev. J. Sibree.*

Madagascar—Flora. *Rev. Scientifique* (4) **5** (1896): 225–234. **Bureau.**

La flore de Madagascar. Par M. Ed. Bureau.

Portuguese East Africa. *B.S.G. Lisboa* **14** (1895): 535–563. **Castilho.**

Acerca de Lourenço Marques. Perigos e deveres . . . pelo socio conselheiro Augusto de Castilho.

Portuguese East Africa. *B.S.G. Lisboa* **14** (1895): 565–738. **Himeria.**

Padroado de Portugal em Africa. Relatorio da prelazia de Moçambique pelo Reverendo Bispo de Himeria.

Portuguese East Africa. *B. S. G. Lisboa* **14** (1895): 491–533. **Machado.**

O territorio de Manica e Sofala sob a administraçao da Companhia de Moçambique, pelo socio Joaquim Machado.

St. Thomas. *B.S.G. Lisboa* **14** (1895): 777–819. **Castilho.**

A provincia de S. Thomé e o golfo de Benim. Por Augusto de Castilho.

Sahara—Dunes. *Rev. Scientifique* (4 S.) **5** (1896): 275–276 **Privat-Deschanel.**

La fixation des dunes au Sahara. Par M. Paul Privat-Deschanel.

South Africa. **Harris.**

The Fate of South Africa. By F. Rutherford Harris. From the *New Review*, March, 1896. Size 10 × 7, pp. [18]. *Map.*

West Africa. *A travers le Monde (Tour du Monde)*: (1896): 41–44. ———

De Dakar au Cap. Juby: Voyage sur la Côte du Sahara. *With Illustrations.*

West Africa—Bida. *Church Miss. Intelligencer*, N.S. 21 (1896): 186–192. **Tugwell.**

Visit to Bida. Bishop Tugwell's Diary.

West Africa—Sudan. **Robinson.**

Hausaland; or, Fifteen Hundred Miles through the Central Soudan. By Charles Henry Robinson. London: Low and Co., 1896. Size 9½ × 6, pp. xvi. and 304. *Map, Portrait, and Illustrations. Price* 14*s.*

This work will be specially noticed.

Zanzibar—Slavery. **Waller.**

The Case of our Zanzibar Slaves: why not liberate them? By the Rev. Horace Waller. London: P. S. King & Son, 1896. Size 8½ × 5½, pp. 20. *Presented by the Author.*

The last words of the Rev. Horace Waller, whose death immediately followed the publication of this pamphlet, devoted, like most of his other writings, to the denunciation of African slavery under European governments.

NORTH AMERICA.

Canada—Quebec.

Reports of the Commissioner of Crown Lands of the Province of Quebec. 1868–1895. [27 Reports.] Quebec, 1869–1895. Size 10 × 6½. *Maps.*

Mexico. *J.S. Arts* 44 (1896): 251–262. **Cheesewright.**

The Mexican Drainage Canal. By Fredk. Henry Cheesewright. *With Map and Illustrations.*

A note on this subject will appear in the Monthly Record.

Mexico—Tehuantepec Ship Railway. *National G. Mag.* 7 (1896): 64–72. **Corthell.**

The Tehuantepec Ship Railway. By Elmer L. Corthell. *With Maps.*

Mexico—Yucatan. **Millspaugh.**

Field Columbian Museum. Publication 4. Botanical Series, vol. i. No. 1. Contribution to the Flora of Yucatan. By Charles Frederick Millspaugh. Chicago, 1895. Size 10 × 6½, pp. 56. *Plates. Presented by the Director of the Museum.*

United States—Baltimore. **Thomas.**

John Hopkin's University Studies in Historical and Political Science. Fourteenth Series. II. The City Government of Baltimore. By Thaddeus P. Thomas, PH.D. Baltimore: The Johns Hopkins Press, 1896. Size 10 × 6½, pp. 52.

United States—California. *Appalachia* 8 (1896): 41–57. **Solomons.**

Mount Goddard and its Vicinity, in the High Sierra of California. By Theodore S. Solomons. *With Map and Illustrations.*

Mr. Solomons takes the Californian Government to task for their neglect of the survey of the mountainous districts of the State; and gives an interesting account, with a sketch-map, of his own explorations.

United States Geological Atlas. *B. American G.S.* 27 (1895): 337–351. **Willis.**

The Development of the Geologic Atlas of the United States. By Bailey Willis.

United States—Indian Territory. *B. American G.S.* 27 (1895): 272–276. **Gannett**

Indian Territory. By Henry Gannett.

United States—Montana. *Appalachia* 8 (1896): 57–69. **Sperry.**

Avalanche Basin, Montana Rockies. By Lyman B. Sperry. *With Illustrations.*

United States—Pike's Expeditions. **Cones.**

The Expeditions of Zebulon Montgomery Pike to Headwaters of the Mississippi River, through Louisiana Territory, and in New Spain during the years 1805–6–7. A New Edition, now first reprinted in full from the Original of 1810, with copious Critical Commentary, Memoir of Pike, New Map and other Illustrations, and complete Index. By Elliott Cones. Three vols. Vol. i., Memoir of the Author—Mississippi Voyage; Vol. ii., Arkansaw Journey—Mexican Tour; Vol. iii., Index—Maps. London: Simpkin and Co., 1895. Size 10 × 6½, pp. cxiv. and 956. *Portrait. Price* £2.

This work has been re-edited, which, on account of the confused manner in which it originally appeared, means, in a certain sense, re-written, and it is provided with a series of original footnotes revealing much of the personality of the Editor.

United States—Washington. *B American G.S.* 27 (1895): 239–255. **Bogue.**

Stampede Pass, Cascade Range, Washington. By Virgil G. Bogue. *With Map and Illustrations.*

CENTRAL AND SOUTH AMERICA.

Argentine Republic. **Quevedo.**

Anales del Museo de La Plata. Seccion de Arqueologia. I. Notas Arqueológicas apropósito de un objeto de arte indigena. Por Samuel A. Lafone Quevedo. La Plata, 1890. Size 18½ × 13, pp. 14.

Argentine Republic—Buenos Ayres. *Rev. Museo La Plata* 7 (1895): 157–168. **Lahille.**

Nota sobre la industria de la pesca en la Provincia de Buenos Aires (excursion de Setiembre-Octubre 1895). Por el Dr. Fernando Lahille.

Argentine Republic—Mendoza. *Rev. Museo La Plata* 7 (1895): 13–96. ——

Exámen Topográfico y Geológico de los Departamentos de San Cárlos, San Rafael y Villa Beltran, Provincia de Mendoza (distritos carboniferos, etc.). *With Maps and Plates.*

Argentine Republic—Rioja. *Rev. Museo La Plata* **7** (1895): 169–180. **Hauthal.**
Primera ascension al Nevado Colorado de Famatina (6150 m.) (Provincia de la Rioja). Por Rodolfo Hauthal.

Argentine Republic—San Luis. *Rev. Museo La Plata* **7** (1896): 97–128. **Valentin.**
Informe sobre una excursion efectuada en la Provincia de San Luis (Republica Argentina), en los meses de Setiembre y Octubre de 1894. Por el Dr. Juan Valentin. *With Sections.*

Brazil. *B. Union G. Nord de la France* **15** (1894): 241–249, 313–330. **Desvernine.**
Voyage de M. Pierre F. Desvernine au Brésil, à travers les provinces de Rio-de-Janeiro, Minas-Geraes et Rio Grand do sul.

Brazil—Matto Grosso. *Rev. Museo La Plata* **6** (1895): 221–250. **Koslowsky.**
Tres semanas entre los indios Guatós. Excursion efectuada en 1894. Por Julio Koslowsky. *With Plates.*

Brazil—Matto Grosso. *Rev. Museo La Plata* **6** (1895): 373–411. **Koslowsky.**
Algunos datos sobre los Indios Bororós. Por Julio Koslowsky. *With Plates.*

British Guiana. *Nineteenth Century* (1896): 390–398. **Comyn.**
The Seamy Side of British Guiana. By Francis Comyn.

British Guiana and Venezuela Boundary.
Venezuela. No. 1 (1896). Documents and Correspondence relating to the Question of Boundary between British Guiana and Venezuela. London: Eyre & Spottiswoode, 1896. Size 13½ × 8½, pp. 444. *Maps. Price* 4*s.* 4*d.*
Maps to accompany the above. *Price* 2*s.* 9*d.*

This blue-book contains a preliminary statement, dealing with the nature and extent of the British claim, and three appendices: (1) Extracts, mainly from Spanish archives, 1595–1802; (2) correspondence relating to early administration of British Guiana, and to the question of boundary with Venezuela, 1799–1893; (3) a series of nine maps. The maps, which are published separately, include (1) Ex ract from official chart of the Dutch West India Company, 1635; (2) Blaeuw's map of Guiana, 1640; (3) extract from official map of [English] Committee of Trade and Plantations, 1733; (4) extract from Dr. Anville's [*sic*] map of Amérique Méridionale, 1748; (5) sketch-map by Dutch Director-General, 1749; (6) Thompson's Chart of the coast of Guiana, etc., 1783; (7) inset of Bouchenroeder's map of the colony of Essequibo and Demerara, 1798; (8) De Pons "Carte de la Capitainerie Générale de Caracas," 1804; (9) Map prepared to illustrate various lines referred to in the correspondence.

British Guiana Boundary. *Petermanns M.* **42** (1896): 21–23. **Wichmann.**
Der Streit über die Grenze von Britisch-Guayana. Von H. Wichmann. *With Map.*

British Guiana Minerals. **Anderson and Dunn.**
British Guiana. Report by Mr. C. W. Anderson, Government Surveyor, and Diary and Report by Mr W. A. Dunn, on the Conglomerate Prospection Expedition. Georgetown, Demerara, 1895. Size 13½ × 8½, pp. 34. *Presented by the Colonial Office.*

Chile. **Anrique.**
Bibliografía Maritima Chilena (1840–1894). Por Nicolas Anrique R. Santiago de Chile: Imp. Cervantes, 1895. Size 8 × 6, pp. 206.

Colombia—Panama Canal. *National G. Mag.* **7** (1896): 59–64. **Hill**
The Panama Canal Route. By Robert T. Hill. *With Illustrations.*

Nicaragua Canal. *National G. Mag.* **7** (1896): 73–76. **Greely.**
The Present State of the Nicaragua Canal. By General A. W. Greely.

Nicaragua—Mosquito Coast. *Z. Ges. Erdk. Berlin* **30** (1895): 498–501. **Richter.**
Der Streit um die Mosquito-Küste. Von Julius Richter.

Peru. *B. American G.S.* **27** (1895): 256–271. **Sears.**
The Coast Desert of Peru By Alfred F. Sears.

Tierra del Fuego. *Ymer* **14** (1894): 203–210. **Nordenskjöld.**
Eldslandet. Några anteckningar af Otto Nordenskjöld.

Venezuela. *National G. Mag.* **7** (1896): 49–58. **Curtis.**
Venezuela: her Government, People, and Boundary. By William E. Curtis. *With Map and Illustrations.*

Venezuela. **Sievers.**

Mittheilungen der Geographischen Gesellschaft in Hamburg. Band xii. Zweite Reise in Venezuela in den Jahren 1892–93 auf Kosten der Geographischen Gesellschaft in Hamburg ausgeführt von Dr. Wilhelm Sievers. Hamburg: L. Friederichsen & Co., 1896. Size 9½ × 6½, pp. 328. *Presented by the Geographical Society of Hamburg.*

This will be specially referred to.

Venezuela Boundary. *Globus* **69** (1896): 53–55. **Sievers.**

Die Grenzen Venezuelas. Von Prof. W. Sievers, Giessen. *With Map.*

AUSTRALASIA AND OCEANIC ISLANDS.

Australia. **Collingridge.**

The Discovery of Australia. A Critical, Documentary and Historic Investigation concerning the Priority of Discovery in Australasia by Europeans before the arrival of Lieut. James Cook, in the "Endeavour," in the year 1770. With Illustrations, Charts, Maps, Diagrams, etc., Copious Notes, References, Geographical Index, and Index to Names. By George Collingridge. Sydney: Hayes Bros., 1895. Size 13 × 10½, pp. xvi. and 376. *Price* 25*s.*

This work will be specially noticed.

Australia. *Nineteenth Century* (1896): 457–464. **White.**

Australia as a Strategic Base. By A. Silva White.

Australian Exploration. *J. R. Colonial I.* **27** (1896): 154–176. **Horn.**

The Scientific Exploration of Central Australia. By William Austin Horn.

Hawaii. **Chambers.**

Johns Hopkins University Studies in Historical and Political Science. Fourteenth Series. I. Constitutional History of Hawaii. By Henry E. Chambers. Baltimore. 1896. Size 10 × 6, pp. 40.

New South Wales—Land Department. ———

New South Wales. Fifteenth Annual Report of the Department of Lands, being for the year 1894. Sydney, 1895. Size 13½ × 8½, pp. iv. and 94. *Maps and Diagrams.*

New South Wales. **Bladen.**

Historical Records of New South Wales. Vol. iii., Hunter, 1796–1799. Edited by F. M. Bladen. Sydney: C. Potter, 1895. Size 9 × 6, pp. xxxviii. and 856. *Maps.*

New South Wales. **Coghlan.**

The Wealth and Progress of New South Wales, 1894. By T. A. Coghlan. Vol. i. Eighth Issue. Sydney, 1895. Size 9 × 6, pp. 466. *Presented by the Agent-General for New South Wales.*

New Zealand. **Rusden.**

History of New Zealand. By G. W. Rusden. Second Edition. 3 vols. Melbourne, Melville, Mullen, and Slade, 1895. Size 8½ × 5½, pp. (vol. i.) xvi., xliv., and 496; (Vol. ii.) xiv. and 642; (Vol. iii.) xii. and 510. *Maps. Presented by the Author.*

The preface to this work contains a report of the libel action in which the publication of the first edition involved the author, and expressions of confidence in the history as a whole contributed by many friends. It is brought down to 1894: and at the end a paper on General Gordon and the Egyptian Sudan finds a place.

New Zealand—Avifauna. *Globus* **69** (1896): 21–24, 42–45, 55–57. **Finsch.**

Charakteristik der Avifauna Neu-Seelands als zoogeographische Provinz in ihren Veränderungen und deren Ursachen. Von Dr. O. Finsch (Delmenhorst). *With Illustrations.*

Queensland. **Jack.**

Stratigraphical Notes on the Georgina Basin, with reference to the question of Artesian Water. By Robert L. Jack. [Read before the Royal Society of Queensland, July 7, 1895.] Size 8½ × 5½, pp. 6. *Presented by the Author.*

Victoria—Statistics. ———

Statistical Register of the Colony of Victoria, etc., 1893. Melbourne [not dated]. Size 13 × 8½.

POLAR REGIONS.

Antarctic. *M.G. Ges. Hamburg* **11** (1896): 62–79. **Petersen.**

"Die Erforschung des Dirk Gerritsz-Archipel." Einige Bemerkungen zu dem Aufsatze. "Das Wiedererwachen der antarktischen Forschung," in Dr. A. Petermann's 'Mittheilungen,' 1895. Heft 6. Von Dr. Johannes Petersen.

Antarctic Exploration. *Aus allen Welttheilen* **27** (1896): 170–178. **Mewius.**

Zur Südpolforschung. Von F. Mewius.

Arctic. *National G. Mag.* **7** (1896): 27–31. **Jackson.**

The Arctic Cruise of the United States Revenue Cutter "Bear." By Dr. Sheldon Jackson, United States General Agent of Education in Alaska. *With Illustrations.*

Arctic—Björling and Kallstenius. *Ymer* **14** (1894): 1–16. **Nordenskiöld.**

Om Björlings och Kallstenii expedition till trakten af Smith Sound. Af G. Nordenskiöld.

Arctic Exploration. *National G. Mag.* **7** (1896): 32–39. **Greely.**

The Scope and Value of Arctic Explorations. By General A. W. Greely.

This paper was read at the Sixth International Geographical Congress.

Arctic Ice-limits. **Ryder.**

Isforholdene i Nordhavet, 1877–1892. Af Carl Ryder. Copenhagen, 1896. Size 8 × 5½, pp. 28. *Maps. Presented by the Author.*

On the position of the ice in the sea between Spitzbergen, Iceland, and Greenland for every year from 1877 to 1892. Sixteen sketch-maps are given, showing the south-western limit of the ice for various months in each of the years named.

Arctic Ocean. *Ymer* **14** (1894): 145–164. **Ohlin.**

Nagra anteckningar om den nutida hvalfängsten i Norra Ishafvet. Af Axel Ohlin.

North-East Passage. *Scottish G. Mag.* **12** (1896): 68–75. ———

The Story of the North-East Passage.

Historical account of explorations along the north coast of Asia.

Spitzbergen. *Ymer* **24** (1894): 25–61. **Hamberg.**

En resa till norra Ishafvet sommaren 1892 företagen med understöd af Vegastipendiet. Af Axel Hamberg. *With Map and Illustrations.*

MATHEMATICAL GEOGRAPHY.

Astronomical Tables. **Johnson.**

The Bearings of the Principal Bright Stars of greater declination than 23° north or 23° south, also those of the Moon and Planets when similarly situated. By A. C. Johnson, R.N. London: J. D. Potter, 1895. Size 9½ × 6½, pp. 44. *Price* 3*s. Presented by the Publisher.*

Catalogue of Admiralty Charts, etc. ———

Catalogue of Admiralty Charts, Plans, and Sailing Directions. Corrected to December 31, 1895. Published by order of the Lords Commissioners of the Admiralty. London: J. D. Potter [1896]. Size 11 × 7½, pp. 254. *Presented by the Hydrographic Department, Admiralty.*

Maps of Europe. **Venukoff.**

Sur la réduction des cartes topographiques à la même échelle. Par M. Venukoff. Size 10 × 6½, pp. 4. *Presented by the Author.*

M. Venukoff remarks on the importance of producing from the staff maps of the countries of Europe, a map of the whole Continent on the scale of 1 : 100,000, or even of 1 : 50,000.

Surveying—Levelling **Reinhertz.**

Nova Acta K. Leop.-Carol. Deutschen A. Naturforscher **62** (1894): 89–194.

Mittheilung einiger Beobachtungen über die Schätzungsgenauigkeit an Maassstäben, insbesondere an Nivellirskalen. Von Dr. C. Reinhertz. *With Plates.*

A critical memoir on the degree of accuracy in levelling operations, with a discussion of instrumental and personal errors.

Time Reckoning **Floquet and Sarranton.**

B. Trim. G. et de d'Archéologie d'Oran **16** (1896): 76–85.

L'heure décimale. Note de M. G. Floquet. Réplique de M. de Sarranton.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Air in the Soil. *C.R.* **122** (1896): 109–112. **Dehérain and Demoussy.**

Sur la circulation de l'air dans le sol. Par MM. P. P. Dehérain et Demoussy.

Aurora. *Oversight K. Danske Vidensk. Selsk.* (1895): 279–302. **Paulsen.**

Effet de l'humidité de l'air et action du champ magnétique terrestre sur l'aspect de l'aurore boréale. Par Adam Paulsen.

Ballooning. *Bihang K. Svenska Vetens. A.* **20** (1895). **Andrée.**

Iakttagelser under en ballongfärd . . . af S. A. Andrée.

In this fascicule Mr. Andrée has five short papers describing a series of balloon journeys undertaken on August 9, October 19, 1893, February 26, April 7, and July 14, 1894. Each trip is illustrated by a series of synoptical weather-charts, track-charts, barometer and thermometer curves, illustrating the conditions in which the ascents were made.

Ballooning and Geography. *Verh. Ges. Erdk. Berlin* **23** (1896): 49–58. **Berson.**

A. Berson: Geographisches aus dem Luftballon.

This paper is specially noticed.

Botanical. **Lister.**

Guide to the British Mycetozoa exhibited in the Department of Botany, British Museum (Natural History). By Arthur Lister, 1895. Size 8½ × 5½, pp. 42. *Illustrations. Presented by the Trustees of the British Museum.*

Distribution of Carnivora. **Grevé.**

Nova Acta K. Leop.-Carol. Deutschen A. Naturforscher **63** (1895): 1–280.

Die geographische Verbreitung der jetzt lebenden Raubthiere. Von Carl Grevé. *With Maps.*

The twenty-one maps here presented form a complete atlas of the distribution of the principal genera of the Carnivora.

Geology—Rocks. ———

British Museum (Natural History), Cromwell Road, London, S.W. Mineral Department. An Introduction to the Study of Rocks, 1895. Size 8½ × 5½, pp. 118. *Plan. Presented by the Trustees of the British Museum.*

Meteorology—Mont Blanc. *Rev. Scientifique* (4 S.) **5** (1896): 257–259. **Janssen.**

Troisième ascension à l'Observatoire du sommet du Mont-Blanc. Par M. J. Janssen.

Oceanography—Baltic. *G.Z.* **2** (1896): 142–158. **Schott.**

Die Hydrographie des Skageracks, Kattegats und der Ostsee. Von Dr. Gerhard Schott in Hamburg. *With Diagrams.*

Oceanography—Gulf Stream. *Petermanns M.* **42** (1896): 25–29. **Lindenkohl.**

Resultate der Temperatur- und Dichtigkeitsbeobachtungen in den Gewässern des Golfstroms und des Golfs von Mexico durch das Bureau des U.S. Coast and Geodetic Survey. Von A. Lindenkohl. *With Maps.*

An English version appears in *Science*, N.S. 3 (1896): 271–274.

Oceanography—Mediterranean. ———

Berichte der Commission für Erforschung des östlichen Mittelmeeres. Vierte Reihe. (Aus den Denkschriften der Kais. Akademie der Wissenschaften in Wien. Bd. lxii.) Vienna: Carl Gerold's Sohn [not dated]. Size 12 × 9½, pp. 176. *Maps and Plates. Presented by the Academy.*

The oceanographical part of this report deals with the voyage of the Austrian man-of-war *Taurus* in the Sea of Marmora in 1894, and has already been summarized in the *Journal*, vol. vi. (1895), p. 81.

Oceanography—Shoals. *American J. Sci.* (4) **1** (1896): 106–110. **Littlehales.**

Improbability of finding Isolated Shoals in the Open Sea by sailing over the Geographical Positions in which they are charted. By G. W. Littlehales.

This will be referred to in the *Journal*.

Physical Geography. **Klein.**

Jahrbuch der Astronomie und Geophysik. Enthaltend die wichtigsten Fortschritte auf den Gebieten der Astrophysik, Meteorologie und physikalischen Erdkunde. Unter Mitwirkung von Fachmännern: herausgegeben von Dr Hermann J. Klein VI. Jahrgang 1895. Leipzig: E. H. Mayer. 1896. Size 9 × 6, pp. x. and 376 *Maps and Illustrations. Price 7s.*

Springs—Temperature. *C.R.* **122** (1896): 97–99. **Martel.**
Sur quelques anomalies de la température des sources. Note de M. E.-A. Martel.

Termites and Soil. *Rev. Museo La Plata* **6** (1895): 413–415. **Koslowsky.**
El rol de los Termitos en la distribucion de los centros de vegetacion arbórea en los llanos. Por Julio Koslowsky. *With Plate.*

Terrestrial Magnetism. *Terrestrial Magnetism* **1** (1896): 28–31. **Bauer.**
Halley's Earliest Equal Variation Chart. Reproduced in *facsimile*, for the first time, from a photograph furnished by Thos. Ward, Esq., of the chart in his possession. *Frontispiece.* Text by L. A. Bauer.

Terrestrial Magnetism. *Atti R.A. Lincei* (S. 5), *Rendiconti* **5** (1896): 41–45. **Sella.**
Misure relative della componente orizzontale del magnetismo terrestre sul Monte Rosa, a Biella ed a Roma. Nota di Alfonso Sella.

Terrestrial Magnetism. *Terrestrial Magnetism* **1** (1896): 18–27. **Schmidt.**
Die Vertheilung des erdmagnetischen Potentials in Bezug auf beliebige Durchmesser der Erde. Von Dr. Ad. Schmidt (Gotha).

Terrestrial Magnetism. **Weyer.**
Nova Acta K. Leop.-Carol. Deutschen A. Naturforscher **63** (1895): 311–398.
Die magnetische Declination und ihre säculare Veränderung für 48 Beobachtungsörter, berechnet als periodische Function für jeden einzelnen Ort aus den daselbst angestellten Beobachtungen. Von Dr. G. D. E. Weyer.

BIOGRAPHY.

Alexander the Great. **Budge.**
The Life and Exploits of Alexander the Great, being a series of Ethiopic Texts edited from Manuscripts in the British Museum and the Bibliothèque Nationale, Paris, with an English Translation and Notes. By E. A. Wallis Budge. 2 vols. Vol. i., the Ethiopic Text, Introduction, etc. Vol. ii., the English Translation. London: C. J. Clay and Sons, 1896. Size 12 × 8, pp. (vol. i.) xvi., liv., and 384; (vol. ii.) 610. *Frontispiece. Presented by Lady Meux.*

This superb work, printed for private circulation at the sole expense of Lady Meux, presents a complete account of the Ethiopic legends regarding the life, travels, and conquests of Alexander the Great, giving the original text as well as the translation and notes.

Astrup. *Globus* **69** (1896): 122. **Nielsen.**
Eivind Astrup. Von Prof. Dr. Yngvar Nielsen in Christiania. *With Portrait.*

Biographical Dictionary. **Lee.**
Dictionary of National Biography. Edited by Sidney Lee. Vol. xlv. Pereira—Pockrich. London: Smith, Elder & Co., 1896. Size 10 × 6¼, pp. vi. and 458. *Price* 15*s.*

The following names of geographical interest appear among the notices in the present volume: Sir Arthur Purves Phayre, by Major Broadfoot; Governor Arthur Phillip, by C. A. Harris; Constantine John Phipps, by Professor J. K. Laughton; Admiral Bedford Capperton Trevelyan Pim, by C. H. Coote; and Walter Chichele Plowden, by B. B. Woodward.

NEW MAPS.

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EUROPE.

England and Wales. **Ordnance Survey.**
Publications since February 7, 1896.
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London—Re-survey, VII. 4, 5, 6, 14, 15, 24, 25, 26, 36, 47, 48, 54, 55, 56, 58, 65, 66, 68, 73, 74, 77, 87, 88: XI. 13, 27; XII. 15; XV. 87. 2*s.* 6*d.* each. Index, 3*d.*

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Germany. **Langhans.**

Justus Perthes' Staatsbürger-Atlas. 24 Kartenblätter mit über 60 Darstellungen zur Verfassung und Verwaltung des Deutschen Reichs und der Bundesstaaten. Mit Begleitworten. Von Paul Langhans. Gotha: Justus Perthes. 1896.

The statistical information contained in this atlas refers entirely to the German Empire. The work of compiling must have been very laborious, and there is hardly any subject connected with the population, trade, commerce, military organization, etc., of Germany on which this little atlas may not be consulted with advantage.

AFRICA.

Abyssinia. **Italian Ministry of War.**

Seconda Edizione della Nuova Carta dei Dominii e Protettorati Italiani nell' Eritrea e Regioni Limitrofe (Sudan-Abissinia-Harar). Scale 1: 1,500,000 or 23·6 stat. miles to an inch. Eseguita dal Laboratorio Foto-litografico del Ministero della Guerra. Gennaio, 1896.

The whole of Abyssinia and parts of the neighbouring countries are shown on this map. All routes are laid down, and a table of distances between the principal places is given.

East Central Africa. **Götzen.**

Reiseweg des Lieutenants Graf von Götzen von Pangani in Deutsch-Ostafrika zum Kongo 1893–1894. 2 sheets. Nach dem Aufnahmen des Reisenden construirt und gezeichnet von Dr. Richard Kiepert und Max Moisel. Scale 1: 250,000 or 3·9 stat. miles to an inch. Geographische Verlagshandlung Dietrich Reimer (Hoeffer and Vohsen) in Berlin.

The important journey across Africa from Pangani to Kivu lake and the Congo, accomplished by Count von Götzen in 1893–1894, is shown, on a comparatively large scale, on this map. The route has been most carefully plotted from the traveller's journals, the date, elevation above sea-level, etc., being given for each day. This map is of special interest, as the portion of Count Götzen's route between long. 30° E. and the Congo traverses entirely new country. An inset is given, showing the whole of Count Götzen's route across Africa.

German East Africa. **Kiepert and Moisel.**

Karte von Deutsch-Ostafrika. Scale 1: 300,000 or 4·7 stat. miles to an inch. Geographische Verlagshandlung Dietrich Reimer, Berlin. Sheets: A 1, Kivu See; B 2. Urúndi.

These are two sheets of the large map of German East Africa in course of publication. Sheet A 1 contains the country round Kivu lake, and the country traversed by Count von Götzen to the west. Sheet B 2, contains the country in the vicinity of Emin Pasha gulf, Victoria Nyanza. The scale is sufficiently large to admit of

considerable detail being shown, and numerous useful notes are given on the body of the map. Where positions have been fixed by astronomical observations, the latitudes and longitudes are written under the name of the place.

Timbuktu. **Vuillot.**

Carte topographique de la Région de Tombouctou dressée par P. Vuillot, Membre de la Société de Géographie de Paris. Scale 1 : 100,000 or 1·6 stat. mile to an inch. Publié sous le patronage de la Société de Géographie de Paris. *Presented by the Author.*

This map has been compiled from the observations of the following French officers: M. M. Hourst, Baudry, and du Belloy, naval officers detached from the Niger flotilla; the itineraries of MM. Puypéroux, Gautheron, Fourpeot, Bluzet, Florentin, Imbert, and Laperrine, officers detached from head-quarters at Timbuktu, and Gundam. The map embraces the country in the vicinity of Timbuktu, and the system of lakes to the west of that place. The positions fixed by astronomical observation have the latitudes and longitudes written under the name of the place. Some notes are given, and a clear explanation of the symbols employed in the construction of the map.

Transvaal. **Jeppe.**

Map of the Southern Goldfields of the Transvaal. Compiled from Official Sources by Fred. Jeppe, Surveyor-General's Department, Pretoria, 1896. Scale 1 : 291,000 or 4·6 stat. miles to an inch. Argus Co., Ltd., Johannesburg. 2 sheets. *Presented by the Author.*

Persons interested in the Southern Goldfields of the Transvaal will find this a useful map. In addition to the information it contains with regard to mining property, all means of communication by rail and road are laid down.

West Africa. **Gruner, Döring, and Carnap.**

Expedition des Deutschen Togo Komitee's unter Dr. Gruner, Dr. Döring u. Pr. Lt. v. Carnap. 1894–1895.

The route followed by the German expedition under Drs Gruner, Döring, and Lieut. v. Carnap, 1894–1895, into the interior from Togoland to the Niger, is laid down on this map.

West Central Africa. **Passarge.**

Reiseroute der Expedition des Deutschen Kameruncomités in den Jahren 1893–94. Aufgenommen von Dr S. Passarge. Construirt und gezeichnet von Dr. M. Limpricht. Scale 1 : 350,000 or 5·5 stat. miles to an inch. Berlin: D. Reimer (Hoefer and Vohsen).

The explorations of Dr. Passarge in the Upper Binue region are very clearly shown on this map, as well as the routes of other explorers. Explanatory notes as to meaning of native geographical terms, etc., are given. The map is very nicely drawn and printed in five colours.

AMERICA.

British North America. **Rand, McNally & Co.**

(1) Indexed Pocket Map and Shippers' Guide of British Columbia. Scale 1 : 2,400,000 or 37·8 stat. miles to an inch. (2) Indexed District Map and Shippers' Guide of Quebec. Scale 1 : 1,160,000 or 16·7 stat. miles to an inch Rand, McNally & Co., Chicago and New York. *Presented by the Publishers through E. Stanford, Esq.*

United States **Rand, McNally & Co.**

Indexed County and Township Pocket Maps and Shippers' Guides of Arizona (Scale 1 : 1,760,000 or 27·7 stat. miles to an inch): Kentucky (1 : 1,160,000 or 18·3 stat. miles to an inch), Massachusetts (1 : 460,000 or 7·3 stat. miles to an inch), Michigan (1 : 1,025,000 or 16·2 stat. miles to an inch), Pennsylvania (1 : 766,000 or 12·1 stat. miles to an inch), Washington (1 : 1,030,000 or 16·2 stat. miles to an inch). Rand, McNally & Co., Chicago and New York. *Presented by the Publishers through E. Stanford, Esq.*

AUSTRALIA.

Western Australia. **London and Western Australian Exploration Co.**

A Map of the West Australian Gold Fields, compiled and published for the London and Western Australian Exploration Company. Scale 1 : 760,320 or 12 stat. miles to an inch. Sheets 8, 9, 11, 12. London: E. Stanford. *Presented by E. Stanford, Esq.*

These are the first four sheets of a map of Western Australia, which when completed will consist of twelve sheets Though primarily intended to illustrate the mineral returns of the country, it promises to be the best general map of this part of West Australia that has been produced in this country.

GENERAL.

World. **Bartholomew.**

Travellers' Route Chart of the World on Mercator's Projection. By J. G. Bartholomew, F.R.G.S. Equatorial scale, 15° to an inch. J. Bartholomew & Co., Edinburgh. Price, 1*s.* 6*d.* on cloth. *Presented by the Publishers.*

All the ocean steamship routes and the distance in miles are given on this map, as well as the difference in time for every fifteen degrees from Greenwich. At the foot of the map there are several insets of the principal ports of the world, the British Isles, and the Mediterranean. The map is clearly drawn, and will be useful for reference in matters connected with steam navigation.

CHARTS.

Atlantic Ocean. **Koninklijk Nederlandsch Meteorologisch Instituut.**

De Guinea en Equatorial Stroomen. Voor iedere maand afzonderlijk bewerkt volgens de gegevens van 2900 Journalen, gehouden aan boord van Nederlandsche Schepen. Utrecht, 1895. "Koninklijk Nederlandsch Meteorologisch Instituut. Stoom-Boek- en Steendrukkerij de Industrie," J. van Druten. *Price f.* 8·5. *Presented by the Royal Netherlands Meteorological Institute.*

The compilation of this atlas has been going on for a considerable time, and it contains the results of observations furnished by the journals of Dutch seafaring men with reference to the Equatorial and Guinea currents. These are given in a series of charts for each month of the year, showing the direction and speed of the current, the temperature of the surface water, the connection between the temperature of the air and the winds, the calms, and the rains. The charts are accompanied by explanatory letterpress. Great care has evidently been taken in the compilation of this atlas, and it forms a valuable addition to our knowledge of the physical conditions of this part of the Atlantic Ocean. The work has been specially noticed at p. 267 of the present volume.

Chile. **Chilian Hydrographic Office.**

Charts Nos. 52, Caleta Camarones, Caleta Chica o Buena, Caleta Gualaguala, Caleta Michilla; No. 53, Isla Juan Fernandez (Mas a Tierra); No. 54, Croquis de la Isla de Mas Afuera; No. 55, Exploracion del Archipielago de la Reina Adelaida. Oficina Hidrográfica de Chile, 1895. *Presented by the Chilian Hydrographic Office.*

Gulf of Mexico, etc. **Lindenkohl.**

(1) Spezifisches Gewicht $\left[\gamma\left(\frac{1{,}026^{0}}{4^{0}}\right)\right]$ des Oberflächenwassers im Golf von Mexico und im Golfstrom. Nach den Beobachtungen von U.S.C.S. Blake. 1880–1882; U.S.C.S. Schr Palinurus, 1878; U.S. Fish. Com. Str. Albatros, 1883–1886; u. H.M.S. Challenger, 1873. Gez. v. A. Lindenkohl.

(2) Temperaturen in Gulf von Mexico und im Golfstrom in der Tiefe von 460 m. (250 Faden). Nach den Temperaturbeobachtungen von Lieut. Com. C. D. Sigsbee, J. R. Bartlett u. W. H. Brownson, 1874–1883. Gez. v. A. Lindenkohl. Petermann's 'Geographische Mitteilungen,' Jahrgang, 1896, Taf. 3. Gotha: Justus Perthes, 1896. *Presented by the Publisher.*

United States Charts. **U.S. Hydrographic Office.**

Pilot Charts of the North Atlantic and North Pacific Oceans for February and March, 1896. Published monthly at the Hydrographic Office, Washington, D.C. Charles D. Sigsbee, Commander U.S. Navy, Hydrographer. *Presented by the U.S. Hydrographic Office.*

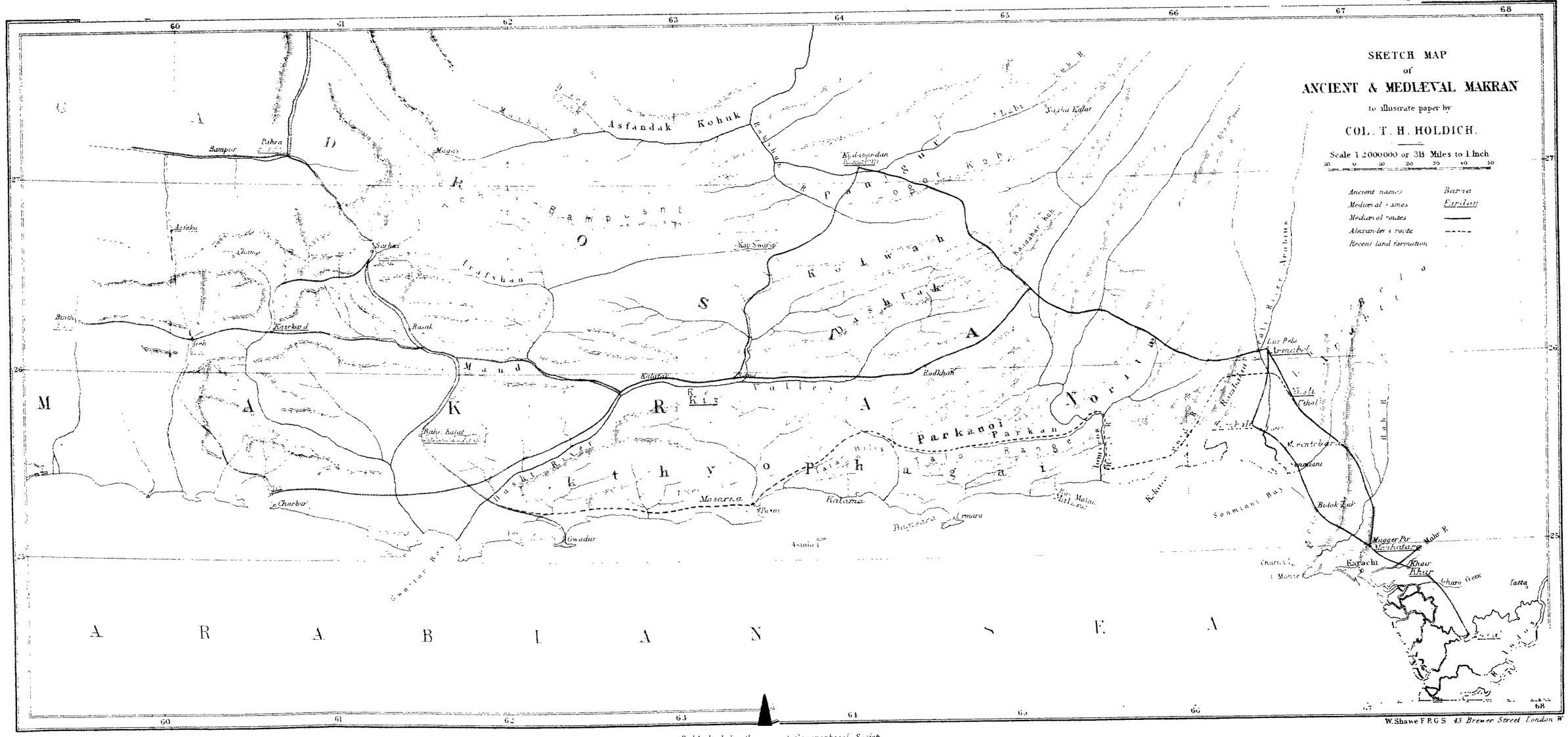
PHOTOGRAPHS.

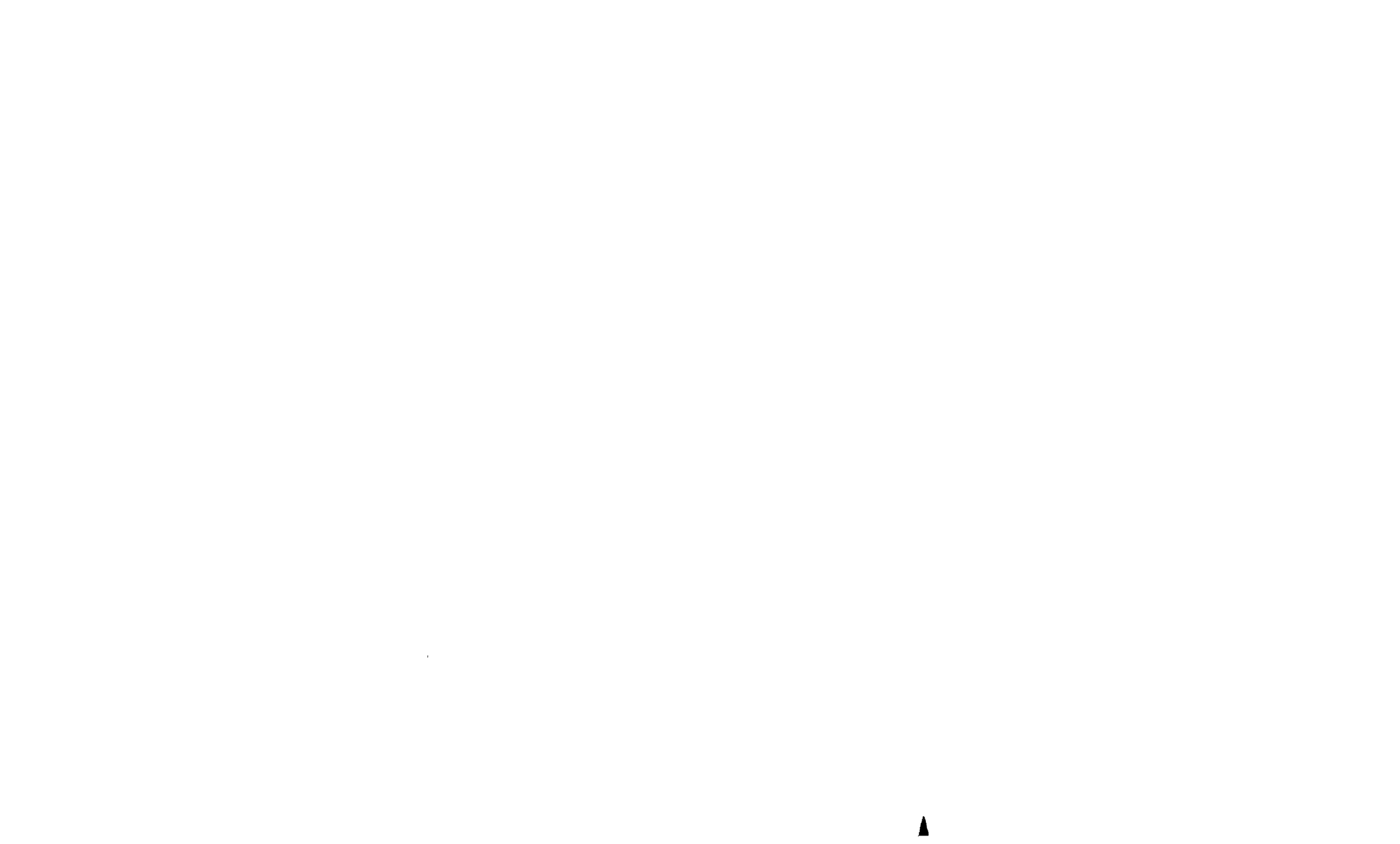
Somaliland. **Gillett.**

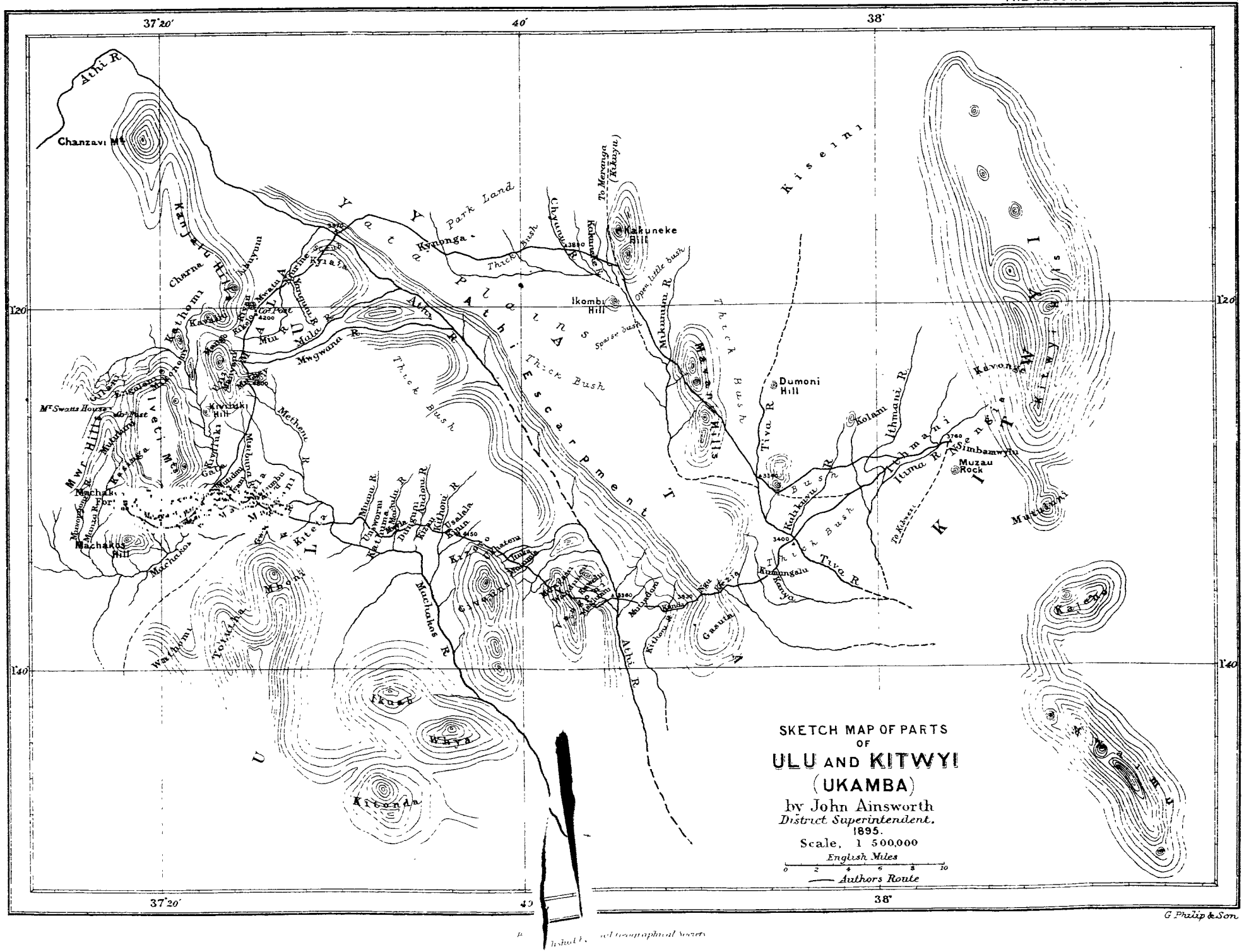
Thirty-three Photographs of Somaliland, taken by F. Gillett, Esq., in 1894–1895. *Presented by F. Gillett, Esq.*

Mr. F. Gillett, who accompanied Dr Donaldson Smith in the first part of his journey in Somaliland, has presented the Society with this interesting set of photographs. They represent scenes in the everyday life of the Somalis, incidents of travel, and the scenery of Somaliland. Many of the photographs are remarkably clear, and, from the subjects having been well selected, they form a valuable addition to the Society's collection.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.


SKETCH MAP
of
ANCIENT & MEDIÆVAL MAKRAN
to illustrate paper by
COL. T. H. HOLDICH.
Scale 1 2000000 or 31½ Miles to 1 Inch
Ancient names
Mediæval names
Mediæval routes
Alexander's route
Recent land formation
Barra
Farsian
MAKRAN
ARABIAN SEA
Bampur
Fahra
Asfandak
Kohuk
Mashkai R.
Rudbar
Panjgoor
Kalagan
Kej R.
Nushki
Yakha Kalat
Kandahar Koh
Kap Swarup
Saiha
Asfaka
Gwatar
Irafshan
Bunds
Kasrkand
Rusak
Mand
Kalatak
Rudkhan
Dasht R.
Kahir kalat
Charbar
Mesarra
Gwadur
Gwatar Bay
Astola I.
Kalama
Parkan
Parkanoi
Kolwah
Dashtiari
Kolwah
Nosrat
Kolwah
Kolwah
Kolwah




37°20'
40'
38'
1°20'
1°40'
Athi R.
Chanzavi Mts.
Kanjalu Hills
Charna Hills
Kathomi
Kavalu
Kyaia
Mwatu A.
Marine Station
Mua Hills
Mua Post
Mwatu R.
Mwanguna R.
Mwiu R.
Mwywanu R.
Yatta Plateau
Park Land
Kyanga
Thick Bush
Chyunuka R.
To Meranga (Kikuyu)
Kakuneke Hill
Kakuneke R.
Ikombi Hill
Open little bush
Mukunuru R.
Athi Plains
Escarpment
Sparse bush
Thick Bush
Kiseini
Mwanetu Hills
Dumoni Hill
Tiva R.
Kolani
Ithumani R.
Kavonge
Kitwyi Hills
Simbamwyiu
Muzau Rock
Iluma R.
Bush
Kalkiawu R.
Thick Bush
To Kibwezi
Mutitini
Kumungalu
Kenya
Mt. Swaata House
Mt. Post
Mwiu Hills
Mutuluni
Kivituki Hill
Kyuvuki
Methanu R.
Kyatuka Mts.
Machakos
Machakos Hill
Machakos For.
Mwongoni R.
Mumui R.
Kitui
Mbooni
Mutuluni R.
Mumui R.
Ukiworini
Kalumbu
Mutulu R.
Kyasa Kithoni R.
Kyasalala R.
Kyondo
Kithasena
Iluka
Mutulu
Mutulu R.
Machakos R.
Kithoni R.
Gasuria
Athi R.
Ikuu
Whya
Kitonda
Kaiyua
Kitwyi
SKETCH MAP OF PARTS OF
ULU AND KITWYI
(UKAMBA)
by John Ainsworth
District Superintendent.
1895.
Scale, 1 500,000
English Miles
0 2 4 6 8 10
Authors Route
G. Philip & Son

The
Geographical Journal.

No. 5. MAY, 1896. Vol. VII.

A JOURNEY ACROSS TIBET, FROM NORTH TO SOUTH, AND WEST TO LADAK.*

By ST. GEORGE R. LITTLEDALE.

We left England on November 10, 1894, the same party as usual:—Mrs. Littledale, myself, and our dog, accompanied in addition by my nephew, Mr. W. A. L. Fletcher, of Oxford University boating renown, who proved himself to be in every respect an admirable travelling companion. My scheme was to strain every nerve to reach Tibet, and, if possible, Lhasa, with plenty of food and animals to carry it. Most of the other expeditions had failed owing to their arriving in a more or less destitute condition, and then, of course, the Tibetans could dictate their own terms. We also relied upon bribery, and went well prepared with the sinews of war for wholesale corruption.

Travelling by Constantinople and Tiflis, we reached Samarkand just as the winter set in. Encased in several thicknesses of fur, we drove to Osh. The cold was so intense that one day five out of the six post-boys at Uratiube were sent to the hospital badly frost-bitten, and our tarantass one night broke through the ice into a river, and was instantly frozen fast. At Osh Colonel Grombchefsky had ordered yurts, firewood, etc., to be ready for us at every march across the Tian Shan, and, thanks to his excellent arrangements, we crossed the Terek pass (12,700 feet) in midwinter without any material discomfort. I may take this opportunity of saying that, as on previous occasions, nothing could possibly exceed the kindness shown to us by all and every Russian official with whom we were thrown in contact. Our guns, stores, and baggage were passed through the customs unopened; Count Rostofftsoff, governor of Samarkand, had ordered a

* Paper read at the Royal Geographical Society, February 24, 1896. Maps, p. 576.

special carriage for us on the train, and sent men to Osh to look out for our heavy baggage.

We arrived in Kashgar on January 5, 1895, and remained for some time under Mr. Macartney's hospitable roof, which was our last taste of the comforts of civilization until the middle of November, when Captain Trench, the deputy-commissioner, kindly received us in his charming house at Srinagar. We found four Ladakis, who had been sent from Leh, waiting for us; but four Pathans we were also expecting had not turned up. We were loath to go without them, as we had been counting on them to stand by us in the case of a scrimmage. The Ladakis, though excellent men in their way, would be of doubtful value in a situation of that kind. We waited there ten days for them, and just as we were starting for Yarkand they joined us. They had had fearful weather on the Karakoram, and three out of the four had their feet frost-bitten. A British native hospital assistant travelled with them, and this wretched man had never attempted to wash or dress their wounds, which were in consequence more serious than they need have been. The Chinese in Turkistan are a very under-sized, effeminate, and degraded race. In passing through the bazaars, a man was overheard to say, "These barbarians, after all, have some men among them." I presume Mr. Fletcher's 6 feet 3 inches called forth the remark.

The Taotai of Kashgar informed us that it was quite true the Japanese had taken Port Arthur, but that afterwards the Chinese had turned them out. An official, who had drilled and armed some 200 men European fashion, once asked the Taotai of Urumtsi to review them. He simply turned his back upon them, and said, "What can they do, compared with the brave soldiers with whom I reconquered this province." We were kindly invited to a Chinese dinner by some official. First there came eight dishes of sweets, cut in small pieces, and rather prettily arranged; then followed sharks' fins, sea-slugs, bamboo shoots, and numberless greasy dishes. Among the guests was Dr. Sven Hedin, who added considerably to the merriment of the party.

The road from Kashgar to Yarkand, about 120 miles, was very uninteresting, ankle-deep in dust. We had some grand views of the Mustagh-Ata and the Gez defile. Every poti (approximately 3 miles) there were square towers about 20 feet high, with crenelated tops, serving the double purpose of watch-towers and milestones. Like everything else in China, they were falling to pieces. Their locations had been chosen more with a view of saving cost by having either stones or bricks handy, than with any regard to the distances they were supposed to measure. At Yarkand we were located in a house which would have been charming in summer, but which was quite unsuited to the arctic weather which we then had. With the help of the British aksakal we commenced to buy our caravan, and

we very soon found that not only were prices materially higher than at Kurla, but the stamp of animal was inferior. After the caravan season is over, horses are tied up in sheds all winter, and their hoofs consequently grow to an abnormal length. The hoof is so tough that the English process of paring them down would be too tedious. The horse is made to stand on a block of wood, and with a chisel and a few blows of a heavy hammer the hoof is shortened. We abandoned all idea of taking camels on discovering that, even travelling empty, they would in all probability be foot-sore, and require a long rest at Cherchen; so we decided to substitute mules and donkeys. While we were buying some mules there was a desperate fight between an onlooker and a Chinese mule-owner, the onlooker trying to persuade the other man to sell. It is a curious custom that you cannot buy the merest trifle in the streets without an "honest" broker turning up, who acts as mediator, and the seller has to be entreated, even threatened, by his friend, to induce him to sell, which he does eventually with apparently the greatest reluctance. Not having been able to procure any rupees or Indian currency notes in London before starting, we purchased all that were offered us. The pilgrims, who formerly used to pass through Russian Turkistan, now, for some reason or other, seem to prefer going to Mekka *viâ* India, and as they absorb a large amount of Indian currency, the price of rupees was very high.

Considering the extremely difficult nature of the country that lies between Rawal Pindi, the railway shipping point, and Yarkand, a distance of over 500 miles, in the course of which no less than five high passes have to be surmounted, and a large extent of barren country to be crossed, it says a good deal for the enterprise and energy of the merchants, that there should be any interchange of commodities between India and Central Asia by the Karakoram route, and it is therefore doubly satisfactory to find that during the last year there has been a large increase of trade. This is, no doubt, partially owing to the opening of a cart-road from Kashmir to the plains of India, the popularity of which road is proved by the long string of carts and other vehicles which are incessantly passing up and down. Great as was the cost in the first instance of making the road down the valley of the Jhelum, and large as are the sums that have yearly to be spent in repairs, there is little doubt that it will prove indirectly a most remunerative investment for the Kashmir Durbar. A capital caravan-track has also been made from Srinagar to the Ladak frontier, to the excellence of which we can personally testify.

On leaving Yarkand, February 4, the weather became warmer; the greater part of the way was deep sand, and the horses must have been very tough to drag the carts through it. On the road we were overtaken by the frost-bitten men, who had been left behind in Kashgar to be doctored by the Russian hospital assistant, thanks to the kindness

of M. Petrovski, who, as on our previous journey, proved himself to be a true friend. Two were doing well, but the havildar's foot was not in at all a satisfactory condition. We had to become doctors and hospital nurses in addition to our multifarious duties.

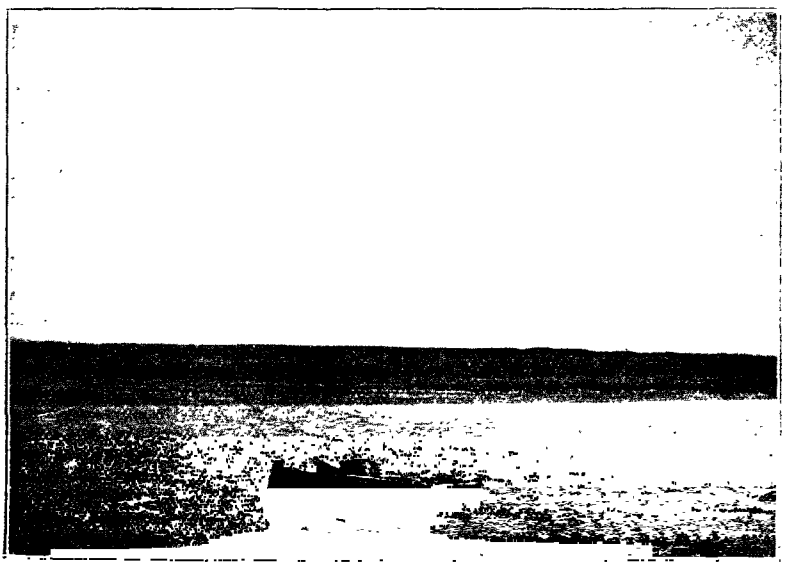
Both in Yarkand and Khotan goitre is very prevalent. We noticed that the enlargement is usually on the right side of the neck, though sometimes on both, and it generally forms two distinct lumps like cricket-balls, one below the other; the natives say it is never fatal. Theoretically, the Chinese monetary system is very convenient: 10 fen = 1 miscal, and 10 miscal = 1 seer; but, unfortunately, all payments are made in tengahs, sixteen of which go to a seer in Kashgar, and only eight in Khotan, so confusion results. We made every effort to buy old manuscripts. We went to visit a native who I was told privately had one. He was a very deep old gentleman, and professed not to understand what was wanted, and eventually we had to leave without ever seeing it. The manuscript, could we have got hold of it, ought to have proved interesting. A native, who had seen it, said that it was written on antelope skin in ancient characters, and that it described all the treasures that had been hidden in the neighbourhood ages ago.

Khotan has been celebrated for its jade for upwards of two thousand years, and the manufactory of the raw stone into bangles, amulets, etc., is still carried on, though there is no work now done here that will bear comparison with the fine jade carving in China. We were offered some ornaments that at first blush we took for fine specimens of jade, but which on examination proved to be glass. We detected the imposition in time, and were thus more fortunate than a distinguished Russian traveller, who bought a magnificent jade vase with the intention of presenting it to the late emperor. In his case, the fraud was not discovered till the vase arrived in St. Petersburg to have a suitable case made for it.

During our stay at Khotan we were very busy buying and branding horses, mules, and donkeys, and laying in large supplies of everything that we could not buy in Cherchen; milk and cream being plentiful, we churned in bottles a good deal of butter, which we salted and soldered up in tins. Our mules cost us from £6 to £10 apiece, the ponies about £4, and the donkeys about £1; Indian corn a farthing a pound. The houses here have no windows, only a hole in the roof. After a few days, the feeling of being boxed-in becomes very depressing. Our men captured a couple of thieves on the roof of a house, and they were well thrashed. We have given out that the next lot will be thrashed first, and then handed over to the tender mercy of the Amban.

From Khotan we went to Keria in carts, passing on the way a good deal of desert. Beyond Keria it was said to be impossible to take our carts, so we paid them off and hired horses and donkeys to Cherchen,

our own animals going nearly empty to save them. From Keria to Cherchen there are two roads. The more southerly follows close along the foot of the mountains, and there is said to be good grass and water most of the way. The northern road, which we followed, goes nearly straight, and is several days shorter; both grass and water are scarce and bad. This road is only used in winter, it being almost impassable in the summer owing to the flies and want of water. Occasionally we would come to small streams, which, descending from the mountains to the south of us, would run north and lose themselves in the sand of the Takla Makan. The Amban at Keria told us that formerly he heard that



BOAT LADEN WITH BAGGAGE ON THE SACHU CHU.

people used to cross the desert to Kuchar, but now nobody ever attempted it or knew the road.

A kind of broom grows very plentifully on the top of steep-sided mounds, sometimes 15 and 18 feet high; the mounds appear to be raised either by the dust collecting in the branches of the plant, when the buried portion of the branches strike new lateral roots and the top puts out new shoots, or by the roots preventing the light pulverized soil from being blown away, or by both these causes combined. In crossing sandhills, I noticed that wherever the sand was in small undulations like the waves of a pond, it was fairly solid, but when the sand had a smooth surface, the horses usually sank in deeply. The windward side of a sandhill was never at so steep an angle as the lee side; I accounted for it in the following manner. Each grain of sand is half protected by the grain below it from the wind, so that it stays there; other grains of sand

are blown over the top one and roll down the lee side till a platform is made large enough for a fresh grain to rest on the summit, half showing above the one below it; and so the mound goes on getting higher and higher till a shift of wind comes which blows the top of the hill away, and the former lee side, now the windward one, is at a sufficiently gentle angle to allow the wind to roll the grains of sand uphill, and so the process goes on.

The natives tell the most marvellous stories of the gold and precious stones that they dig up from the ruins of the cities buried by the sand. They make regular expeditions into the desert to recover lost treasures, and many of them had strange tales about old fortified cities which were guarded by ancient men in quaint Chinese costumes, speaking an unknown tongue. The only water-supply of a small village between Keria and Nia was a well 120 feet deep; the hauling of water must be a severe tax on the inhabitants, as it is all done by hand. The whole of our caravan had to be watered there, as we had the next day a long march of 35 or 40 miles to Nia, the nearest drinking-place. Here we hired some more horses to go to Cherchen for the reasonable sum of 6*s.* 8*d.* a horse, a ten or twelve days' journey with no chance of a return hire. We sent on four men, who were to keep ahead of us and deepen the wells along the road, which are rarely more than 6 feet deep, and are constantly filling up with drifting sand. The large number of animals we had then with us required a good deal of water. At one camp we found the water in the wells quite undrinkable; none of the animals even would touch it, so we determined to dig a fresh well for ourselves. The donkey with tools not having come in, the Ladakis set to work with their bare hands, and they had got down 4 feet before the caravan arrived. A couple of feet deeper we found plenty of good water. In old wells the saltness of the water is due to continual evaporation of the water, while the salt that is in the water does not evaporate; consequently the water and the neighbouring soil becomes gradually more and more impregnated with salt. Precisely the same thing goes on in every lake that has no outlet. We afterwards discovered that wherever chi grass grows, there is always water within 5 or 6 feet of the surface. Between Nia and Cherchen there were hardly any inhabitants, only a few shepherds here and there. Occasionally we would pass forests of poplar and stretches of chi grass, but the bulk of the country was dry sand, and whenever we climbed an elevation we could always see, stretching away to the northern horizon, mound after mound and ridge beyond ridge of the moistureless shifting sand of which the horrible desert of the Taklamakan consists.

On March 19 we reached Cherchen. There is no town proper, but the houses are dotted here and there amidst irrigation fields; we did not see a single Chinaman, all the inhabitants apparently being Turkis.

We were informed that the mountain range called the Tokus Dawan would be impassable for three months. Being incredulous, we sent off a couple of our own men to see, and while they were gone we purchased supplies largely. We were lucky enough to hit off one of the only two bazaars that are held annually in the place. The people who came to the fair made extremely convenient temporary hammocks for their babies out of men's coats, which were slung by the arms from tree to tree, the little things remaining in them quite contentedly while their parents attended to their business. We had some tent-pegs made here for fivepence apiece. How they can sell them for the money I



NEAR THE GORING LA

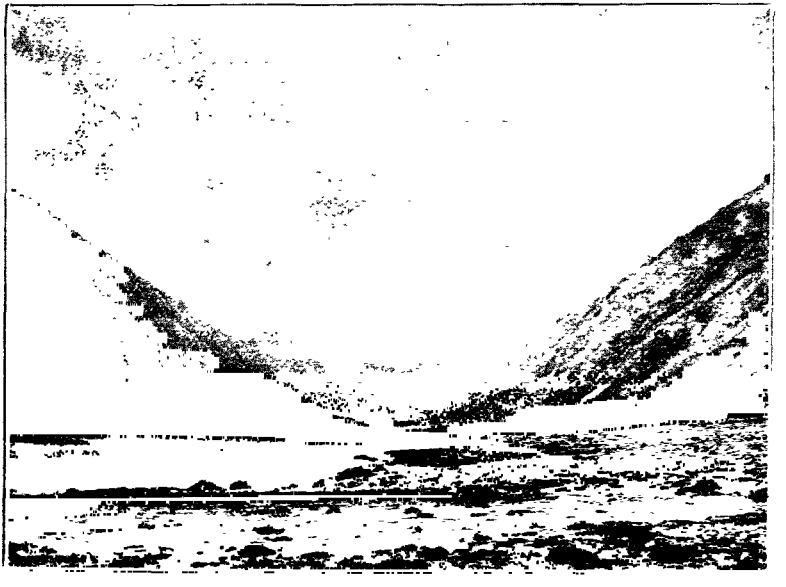
cannot conceive. All the iron comes from Yarkand, and it must reach there either from India or Russia, an immense distance in either case. As an instance of how rapidly vegetation comes on with the warm weather, on April 5 the apricot trees only showed faint indications of buds; two days later they were shedding their blossoms. We ran short of change, so we followed the custom of the country and sent some of our big lumps of silver to the blacksmith, who, under careful surveillance, cut them up into little bits. We took with us 25,000 lbs. of Indian corn for our animals, and six months' provision for ourselves and men. Our caravan consisted of 250 animals, but of these, 130 or 140 were hired with the understanding that they were to return on reaching the south side of the Akka-Tagh. The caravan people to a man declared that they had never been so far south as the Akka-Tagh—a statement which we much doubted. Through the dilatoriness of the natives, we could not start before April 12. We had in our employ a Ladaki who accompanied

Monsieur Dutreuil de Rhins, and had been somewhere in this district; but he accounted for his utter want of knowledge of the country by the statement that when he was here before he was snow-blind. He strained his back soon after leaving Cherchen, and we sent him down from the mountains with some hired horses. We soon left all cultivation behind, and marched up the Cherchen river through a barren sandy country to the Tokus Dawan. Leaving the river, we twisted and turned up narrow valleys having steep clay hills on either hand, with at first little or no grazing, but sufficient bortza for fuel. Some days after we rejoined the rapid muddy Cherchen river flowing through a deep valley, bounded on the south by the snow-clad Tokus Dawan. In one place the rocks descended steeply into the river, but by making a road we were able to lead our animals over safely one by one. The following day we tried to ford the river, but, finding it impossible, marched along its banks for a couple of days before we could cross, thus wasting three or four days before we could make further progress south. After crossing, we turned down stream again, and eventually camped in a valley where there was good grazing and water.

At our next camp grass was very scarce, and there was no water. Soon after we came to the Cherchen river for the third time. It here flowed through a marsh, which was fortunately frozen through solid, with the exception of the main channel, that had cut through the ice, leaving perpendicular sides 4 or 5 feet high. After finding a ford, we had to hack with axes an inclined path to the level of the water on each side of the river to enable the animals to descend. Our caravan was so large that it took some hours getting it across. The first detachment got over easily; but later, as the sun got power, big sheets of ice came tearing down stream. A sharp look-out had to be kept to avoid disaster. While I was on horseback in mid-stream, helping a man who was trying to save one of our animals which was being carried down the stream, a piece of ice struck my pony behind, and we were carried down 50 yards before I could get clear; the animal, fortunately for me, kept his legs, for the water was bitterly cold. We marched up a broad plain, the snowy Akka-Tagh being still to the south, and we here saw our first Tibet antelope (*Panthalops Hodgsonii*) and kyang (*Equus hemionus*). As we went on both game and grass grew scarcer, and at our camp there was next to none. Here a deputation of our drivers came asking permission to go back with their animals, pleading the want of grass. We put them off with fair words, and plodded on some days through utter barrenness.

On April 28, in bitter weather and snowing hard, we crossed a pass. There was little or no vegetation, and the Ladakis said they felt the breathing more than on the Karakoram. Soon after crossing we found slight vegetation, but as we went on that ceased, and we had to camp in a plain where there was absolutely nothing for our animals to eat.

Ahead of us, as far as we could see, there were high mountains. Having no guide, we took the most likely looking valley, and it ended in our camping near the summit of a pass in intense cold, where there was neither grass nor fuel. Having brought for an occasion like this some tins of Silver's self-boiling soup, personally we did pretty well. There was plenty of ice, but no fuel, so we could not melt it, and had a dry camp. A valuable horse died here. As he was travelling empty, I suppose the great elevation was the cause. The next day things looked very black; there were no signs during our march of either grass or fuel till evening, when the valley suddenly opened out, and to our



A TYPICAL TIBETAN VALLEY.

great relief on the other side of a broad plain we saw water and grass, and in the distance a frozen lake. To the south hills appeared, low, and, as the lake had no apparent outlet, we imagined we were over the Akka-Tagh and on the Tibet plateau. Two of our men who I sent on to see the country ahead reported it all right, so we paid off our hirelings with the exception of some donkeys, which their owners agreed to take a week's journey further. I very soon found that we were not over the Akka-Tagh at all, and that our men, who were supposed to have crossed the hills to the south, had deceived us, and had never done so; so, taking a Ladaki with me, I made several efforts to find a suitable pass over the mountains. On climbing a ridge to the south, instead of finding myself, as I hoped, on the edge of the Tibetan plateau, I saw in front seven extinct volcanoes; three were small, but four of them

were grand fellows. They stood quite apart, and were unconnected either with themselves or with the Akka-Tagh, which lay further south. The summits of the volcanoes were so covered with masses of snow and ice that it was not possible to see their craters; and between us and the Akka-Tagh lay such a rough, barren country, that we decided to spare our animals and look elsewhere for a passage. It took us ten days before we discovered a pass and collected our animals, which had been dispersed by a heavy snowstorm.

We crossed the Akka-Tagh on May 15. The pass, though not steep, was high and long, and it cost us the lives of five or six donkeys and a couple of horses. We found ourselves at last on the Tibetan plateau, having lakes and low mountains to the south, as far as could be seen, and to the north we had the high range of the Akka-Tagh, with fine glaciers and snowfields. By angles taken from several different points, I measured two peaks close together, which towered above their neighbours, and I made them out to be 25,340 feet. This great upshoot of the Earth's surface, which from its enormous elevation and size deserves, in its central part, far more than the Pamirs the name "Roof of the World," may be considered to commence in the west with the Pamirs, where, however, its physical character differs in some parts considerably from the central or Tibetan portion, which again bears little resemblance to its eastern continuation on the confines of China. On the Pamirs we find a high mountainous country. Where the rivers are fairly large and rapid, the valleys are precipitous; in other parts, where the streams are unimportant, the country is more undulating in character, and the lakes are, with some notable exceptions, fresh. The Tibetan plateau proper, which probably has an average height quite 2000 feet in excess of the Pamirs, has, in its northern part especially, a very small rainfall, and in the absence of rivers the drainage of the country finds its way into one or other of the innumerable lakes, which, having no outlet, are salt. Except in the volcanic country, the valleys are broad and open. The eastern end, however, is the cradle of numerous large rivers which discharge their waters into the Indian Ocean and China Sea, and which in the course of ages have worn deep channels, and entirely changed the character of the country. Nearly the whole of this large district lies above timber-line, and it would, I imagine, be possible to travel from the Pamirs to within a short distance of China proper, about 30 degrees of longitude, without ever seeing a tree or shrub higher than an umbrella.

We purchased here the pick of our hired animals, and the others went back, thus severing our last link with the outer world. Our party consisted of our three selves and ten men, thirteen in all, an unlucky number; but we decided to get over the difficulty by counting in our terrier, which had much more sense than some members of the party. A Turki who had agreed to come with us, and who as an inducement had

received a good many months' wages in advance, here evidently intended to bolt back to Cherchen, and as we were terribly short-handed we took the liberty of decorating him for a few nights with a pair of handcuffs. He afterwards proved to be quite one of our best men.

We passed through a volcanic country with little grass, and water rather scarce. Later in the summer the grass would be better, but in May there was only the previous year's growth, which had had all its nutriment weathered out of it, and our animals began to suffer severely. Owing to the scarcity of fodder they wandered a great deal, and we had constantly either to make a very late start or stay a day while the missing



A TIBETAN GROUP IN THE GORING TANGU VALLEY.

animals were found. Antelope were fairly numerous, and in some cases absurdly tame. One old buck followed alongside me, gradually edging nearer and nearer till he was within 40 yards; he then trotted round in front and stopped till he got our wind, and then went off. He evidently had never seen a white man before. We were on a part of the Chang where there was no trace of human beings, and no reason why there should be any. Water was very scarce. We frequently found a small spring or patch of snow sufficient for our party, but the animals had to make many dry camps. One morning our flock of nineteen sheep were missing, and it turned out that the men through carelessness had not tied them up the previous night, and the wolves had killed every one, giving them each a bite on the throat and leaving them. We now had to rely entirely on our rifles for food. Owing to the high altitude, scarcity of food, and

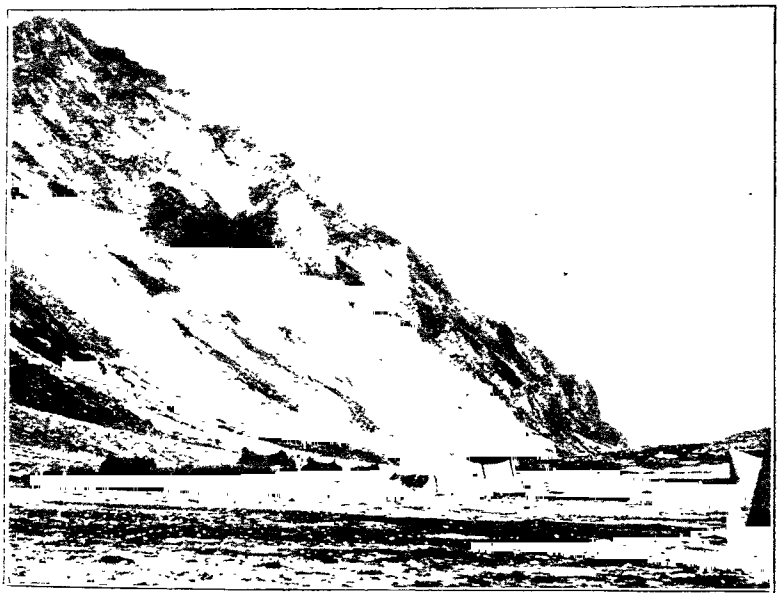
cold, our animals began to die off at an appalling rate, and my nephew and I had to give up our riding-ponies to carry the stores. Having to walk made our work rather severe, as, in addition to packing and repacking our animals, going ahead to find the road for the morrow, we had also to make a special tramp for our dinner, unless we had had the good luck to shoot some game during our march. The mountains ahead looking very uninviting, the caravan bashi and I started off for a couple of days to see if we could find a road over them. In the distance we saw a high volcanic-looking hill, to the top of which we struggled, and had a capital bird's-eye view of the country. We had seen for some time previously what looked like a continuous high snowy range stretching east and west right across our course, and how we were to get over it had been the cause of much anxiety, but I was relieved to find that what had appeared from down below to be one range, was really an unconnected succession of short ridges and peaks; in fact, after we left the Akka-Tagh we never saw a single continuous mountain range till we came to the Ninchen-Tangla, south of the Tengri-Nor.

On returning to camp, I found that, although stationary, our animals were dying in an ominous way, and the survivors were so weak that when they fell or lay down, we had to lift them on to their legs again. We had utilized every scrap of felt we possessed to make extra clothing and hoods for our donkeys, but all to no purpose; the mortality was terrible. After making one more march, we decided that everything that could possibly be spared must be abandoned, clothes, camp furniture, and natural history specimens, horse shoes, even the very bindings of books which were essential, were ruthlessly abandoned. Our men, seeing new clothes thus thrown away, wished to exchange their own rags for them: we told them they might take what they liked, but if any one took a coat, for instance, he must leave his own in exchange. It was, perhaps, a little difficult to arrange an exact equivalent for some ladies' garments. A very fine yak's head was among the condemned articles, and it was a source of almost secret satisfaction to find, a couple of days afterwards, that it had been carried on by mistake. The following day, however, things became still more critical, and it had to go with the rest.

We travelled on for some time with a dwindling stud over a succession of passes of no great height above the general run of the country, but many of them were steep, and all trying for our weak, exhausted caravan. Not a day passed but several animals had to be shot or abandoned. It is a gruesome subject which I will not further pursue. We passed three very conspicuous volcanoes, which must have been considerably over 20,000 feet. They had made excellent landmarks for some time previously. Between 36° 50′ and 33° 50′ N. lat., our path lay through a very volcanic region, numerous undoubted volcanoes being visible. South of 33° 50′ I did not notice any, till three months later we passed the conspicuous volcano Tongo. We struggled on, and just as

things were getting desperate we found some excellent grazing, and we stayed for a week to fatten up our animals. The weather became milder, and those beasts which were not too far gone regained strength rapidly; the poor animals ate incessantly from morning to night.

June 26, lat. 33° 12′ N., and long. 88° 12′ E., was remarkable for two things: we had the first rain since leaving the Black Sea in November—and I think at this point we first came under the influence of the south-west monsoon; the skies became more cloudy as we went south, and we frequently had small showers—and we saw the first men since Cherchen, in the middle of April. These men were Tibetans, and



LAMAS' ENCAMPMENT WITH PILES OF FIREWOOD.

had large flocks of sheep and herds of yak, and they were collecting large piles of salt from the lake near their camp for the monasteries of Lhasa. We kept sentries over our horses all night and day, and we watched their camp carefully to see if we had been discovered or if they moved. We examined the ground, and decided it would be impossible to get over the large plain on which they were encamped without being seen unless we made a night march, so at sunset we started. We had not gone far before we stuck in a swamp, and there was every prospect of our having to remain there all night and being discovered in the morning, but we managed to struggle through just as the moon set, and, marching all night, we camped at dawn in a secluded valley across the plain. We always went on ahead of the caravan, and looked carefully over the ground with our telescopes, and whenever we saw any

encampments we used to try and avoid them by changing our route, and if that was impossible, then by making night marches. Just at one critical time, when passing at night close to an encampment, the donkey carrying our pet cock and hen chose to tumble, and there was a great cackling and fuss; then a mule trod on our Turki dog, who gave a piteous howl. I found a luminous match-box a great assistance in reading the prismatic compass during the night marches when a lantern was impossible. One small herd of yak, which was right in our track, caused us great anxiety, but it turned out afterwards that they were wild ones. We were making very short marches, camping each day as soon as we got good grazing, and doing everything in our power to get our animals strong after the terrible ordeal they had passed.

We were everlastingly crossing from one lake basin to another, but as we got south the gradients became less steep than what we had met with further north. Game was here scarce and wild, but large herds of kyang, sometimes two and three hundred in a drove, would gallop and wheel round our donkey train. We passed along the east side of the lake called by Captain Bower Garing Cho, into which runs a river, which we were unable to ford. We could not go further east, because the plain was alive with herds of yak and sheep, and we should have been discovered; so we constructed a sort of boat, using our camp beds to make a framework, which we covered with the waterproof ground-sheet of our tent. It answered capitally, and with a rope from side to side we ferried ourselves and all our stores over dry. Our animals swam across. The following day we found the plain deserted; the herds had all been driven about 10 miles to the south. At first we were afraid we had been discovered, as one of our mules had strayed close to a Tibetan camp. Finding it impossible to get past unseen to the west, we turned more to the east. Seen from a distance, the shores of the Pongok Tso appeared to be piled up with ice-floes, but on getting closer we found the white appearance was due to salt. The grazing in this district was of the most luxurious description, and our animals were now in capital condition. There were so many encampments about, that we were liable to be discovered at any moment. We stopped within a mile and a half of one encampment, but by keeping our animals in a ravine till dusk, and letting them feed at night, we were unnoticed. At last we came to a valley in which we counted thirty tents; thinking it quite useless to attempt any further concealment, we decided to go straight through them. We kept up on the hills till the last moment, and then went between the encampments, and to our amazement got through undiscovered. They took us for a trading party. We had made our natives keep the caravan bunched together; Mrs. Littledale, Mr. Fletcher, and I, having removed our hats, kept out of sight amongst the baggage animals. We waited till dusk before we dared pitch our tents, for they would have instantly betrayed us. The following day, however, we had to pass up a narrow ravine in which

there were some shepherds. The men, on seeing us, pluckily bolted up the mountains, leaving their wives in charge; then the murder was out, and they came and asked us to stop till they could communicate with their headmen. They appeared to be a very good-natured lot of people, and were very friendly, laughing and talking with our men. It was palpable that the common people bear strangers no ill will, and that all the trouble springs from Lhasa.

We now entirely changed our tactics, and pushed on as hard as we could, and, our animals being in good condition and having very light loads, we travelled very fast. We calculated that we could reach Lhasa in eight forced marches, and we had kept sixteen donkey-loads of grain through all our troubles for this occasion, so our animals got a feed of corn night and morning. The local officials came and entreated us to stop, informing us that they would all be executed if they allowed us to pass; and as we travelled, bands of men, armed with matchlocks, and with swords stuck through their belts, kept on either side of us, and every morning some official would try entreaties and threats. Our object was to push on so fast that they would not have time to collect their militia in sufficient numbers to stop us. Having no guides, we were often at a loss as to the best road to take, but on one occasion this helped us considerably. Turning one evening up a valley, we camped, but not liking the look on ahead, we retraced our steps early next morning. That move completely upset the plans of the Tibetans; they had evidently thought we were going that way, and the bulk of the men had gone on ahead, and we made the next day's march unmolested. On approaching difficult ground the Tibetans would always stop behind, and leave us to flounder amongst the rocks or swamps, and whenever any of them stated that there was no road in a certain direction we knew we were not wanted to go that way, so when in doubt we always did the opposite to what they advised. We crossed a low pass, and then came in sight of the Tengri-Nor, locally known by the name of Nam-Tso = Great Sky Lake, vividly blue, stretching away far to the east, with here and there a small island. A number of promontories jutted into the lake from the north, while on the south it was fringed by the magnificent range of the Ninchen-Tangla;—a succession of snow-clad peaks and glaciers, partially hidden in clouds and vapour, which added to their size and grandeur, while above all towered with cliffs of appalling steepness the great peak of Charemaru, 24,153 feet. From this point of view it was, perhaps, one of the most impressive mountains I had ever seen; but as we went further south, and changed our point of view, we found that it was not a needle-shaped rock piercing the sky, but a sharp ridge, having a peak at either end. In the Lama survey map of Tibet, published 1733, there is a mountain marked Chimuran, in very much the same position as Charemaru; the similarity of the names can hardly be accidental. We passed within a few

miles of the monastery Dorkia Lagu Dong, but an intervening hill prevented our seeing it.

As we approached the Ninchen Tangla, we were very much perplexed as to how we were to cross that mass of snow and ice, and another obstacle in a deep rapid river appeared. We wasted a couple of hours in finding a ford, which was a bad one at the best. Here the Tibetans came up in a body and announced that they would not allow us on any terms to cross the river, and on advancing, a determined picturesque-looking individual seized my bridle; I whipped out my revolver, and he immediately let go. We forded the river, watched by the party with scowling looks. We had not the faintest notion up which valley, if any, the pass was, and men whom we sent out over the plain to find a track returned without information. One Ladaki, however, who had been sent to watch a man who we thought was going with a letter to the Deva Jung, and from whose movements we hoped to get an inkling of the Lhasa road, announced that he had seen some laden yak, which must, he thought, have come down one of two valleys; so we headed the caravan in that direction on the chance, and camped in the dark in pelting rain, everybody quite tired out; for since we had been discovered we had not only to march all day, but keep guard over our animals all night. At midnight we sent our two most reliable men to see if they could find a road. One, on returning, said the grass in a valley was all eaten short, and he thought it might be the right valley; so we started next morning.

None of the Tibetans were now to be seen, which made us rather uneasy, for it proved one of two things: either we were on the wrong road, or they had gone on ahead to hold some strong position. The latter was the case. We found them occupying both sides of a narrow ravine, lying down behind stones, with only rows and rows of black heads visible. As we approached, some six or eight men came out to meet us, and they said they would shoot if we advanced. I pulled out my Chinese passport, and said it was given by a greater man than any at Lhasa. But it was all to no purpose; give us leave to advance they would not. So I told our men to load their rifles. The three sepoys had Colt's lightning-repeaters—and very handy weapons they were; Mr. Fletcher and three other men had expresses, etc.; I a Mannlicher; and the rest of the party had theodolite and camera-legs put into spare gun-covers, and they made a brave show. Mrs. Littledale was very indignant with me because I would not let her have a rifle, and insisted on her keeping back among the baggage-animals. I turned round to see which of our men were going to back us up, and there were the three Pathans, nursing their rifles, looking at me with murder in their eyes, impatiently awaiting the signal to begin. If any nation is counting on our Indian soldiers not proving to be fully a match for any troops they may be sent against, I can assure them they are making a grievous

mistake. Here were these men, who had been through the Kabul war and knew what fighting meant, ready to face hopeless odds simply because their sahib ordered them. They did not know what we did, that our opponents were such utter cowards that the odds were very much against their having the pluck to fight at all. Our bluff succeeded; the matches of their guns were extinguished, they did not fire, and we passed unharmed. A Tibetan headman said afterwards to one of the Ladakis, "These foreigners must be a great people." He replied, "Of course they are; when they go to Pekin they are always honoured guests of the Emperor of China!" We pushed on up the pass, which formed a water-parting between the Tibetan plateau and the country drained by the Brahmaputra river. We found by keeping to the rocks we avoided the glacier, which was much crevassed.

We reached the summit of the Goring La (19,587 feet) about 4 p.m. We waited some hours for our animals to come up, but the donkeys were not able to get over that night; so, leaving a guard with them, we started down the glacier, as night was coming on, in a snowstorm which covered up all tracks, and we had to grope our way, avoiding crevasses by sounding each step with an alpenstock—a far more dangerous business than facing any number of Tibetan matchlockmen. On camping we found that every scrap of food was with our donkeys, and so all idea of a rush for Lhasa had to be abandoned. When they arrived they were all so played out we stopped a day. A Tibetan swell came with about a hundred men: he was such a comical, roundabout, jovial-looking man. While talking he gesticulated and grimaced to an extraordinary degree. He wore a broad-brimmed hat carefully covered with green oil silk. On the principle of not cheapening ourselves, we professed to be dissatisfied with his rank, told him that we would neither stop nor discuss our plans with any little man, and pushed on. He kept repeating, "Kuch, kuch," with his thumbs up in the air, and making signs with his hand across his throat. The numbers opposing us increased rapidly, and at last I thought it prudent to ask the headman if he would really lose his head if we advanced. He replied, "Undoubtedly." So I told him that, though his rank was beneath our contempt, still, as he seemed a decent sort of fellow, we would stop for his sake. He informed us that he would probably be fined a rupee for every footprint our horses had made this side of the pass. The latitude of this camp was 30° 12′ 12″ N. The natives said they ordinarily took two marches, but, with a good horse, could go to Lhasa in a day. He asked if it was true that there was a big tree near Calcutta, out of the branches of which came all the heat of India; and whether our telescopes enabled us to see right through the mountains.

The next day three more Lamas arrived. They professed great pleasure at seeing us, but wished to know why we had undertaken such a journey. They were told we had come to make our salaams to the Dalai Lama.

Things did not progress. They asked if we would not go back, and they would not allow us to go forward, what did I think would happen? I answered by another question, What did they think would happen when the news reached India that we, bearing Chinese and English passports, had been shot while passing peaceably through their country? They hurriedly said there would be no fighting. Our negotiations went on for about a week; we at last declined to discuss further the question of returning, and all stood up in our tent to show the interview was at an end. Daily letters were all this time passing between them and Lhasa. We were left alone for some days, and amused ourselves by catching butterflies and making botanical collections. Wishing to keep on good terms with the Lamas, we did no shooting, as of course it is contrary to their tenets to take life so near their sacred city. My attempts to measure some of the men were not successful; they were frightened to death of the Lamas, so I did not persist. All the Lamas that we met in this part of the world belonged to the yellow or orthodox sect; but in Ladak the Lamas wore red, the distinguishing sign of the unreformed Church. I descended the valley some distance, and climbed a mountain, hoping by the aid of my telescope to see some of the monasteries round Lhasa, but a high intervening range cut off the view. From this point we were 48 or 49 miles from Lhasa. More negotiations followed. We declined to abate our demands, which were that we should have an interview with the Dalai Lama, stay a couple of days in Lhasa, and return to India by the Jelap La and Sikkim. Two more high officials with several smaller Lamas then arrived. One was said to be the governor of Lhasa, the other head of the soldiers. "Back the way you came, and at once; those are the orders of the Dalai Lama, which must be obeyed," was the burden of their song. After some days, finding that we would not give way, they showed the first sign of weakening by offering to let us return by China; then they tried to induce us to go to Ladak by the Chang; and finally they announced if we would only re-cross the pass we could go where we liked, and by whichever way we liked. We still remained pig-headed, and they wrote for more instructions. They seemed to be terribly afraid of poison, and would not touch our tea till we had drunk some first. They received with incredulity my statement that in England a poisoning case was not only exceedingly rare, but that it was looked upon as a particularly odious crime.

The Lamas had brought a trader with them as interpreter, Wohabjew by name; he had made six trips to India, and spoke Hindustani fairly well; with him we had long talks. He said the present Dalai Lama is about twenty, and that he was to come of age that November; then the Rajah of Lhasa, who acted as regent, would lose his power and retire into private life. He went on to say that the two last Dalai Lamas had died between the ages of eighteen and twenty. It seems to be a peculiarly fatal period in Dalai Lama life, as the death-rate was

much understated. The last four Lamas, instead of only two, having been reincarnated about those ages, I am curious to hear if the present one has followed the example of his predecessors. This regent has held office for forty years; he doubtless, therefore, is in a position to give some interesting details of the last illnesses of two Dalai Lamas. It should be explained that the soul of the Dalai Lama never really dies; it descends to some infant, whom it is the business of the Lama priesthood to discover. I could not make out by what particular signs the new Dalai Lama is identified, but the Lamas with whom I conversed would not admit the possibility of a mistake. When found he is brought in great state to Lhasa, surrounded by crowds of Lamas, who educate him for the position he is so seldom allowed to fill. The present Dalai Lama was discovered in baby form at Thokpo, five days from Lhasa; his father was a Zamindar, but both parents are now dead. His three brothers are alive, and have risen with him, and are now great people in Lhasa. The Teshu Lama at Shigatze is also under age, being a boy of twelve or thirteen, who, during his minority, is under the tutelage of Lhasa. When a Tibetan Lama or layman dies, they carry the body to a mountain, cut it in pieces, and the vultures do the rest; and they entreated us to let loose a vulture we had captured alive, saying there was no means of knowing who he might represent. But when the Dalai Lama dies, he is embalmed, and they insert gold and jewels into his face to the value sometimes of one or two lacs. The three great incarnations, the Dalai Lama, Teshu Lama, and the Taranath Lama, are all equally holy, and their sedan chairs, when in Lhasa, are each carried by eight bearers, but the two Chinese mandarins are only allowed four bearers apiece.

The Lhasa merchants are forbidden by the Deva Jung to use the Jelap-La and Darjiling road, and are compelled to travel either by Bhutan, where they would certainly be looted, or Nepal, where, in addition to a tax of 5 Rs. per head, they have heavy transit duties to pay. Last spring a large deputation of over a hundred merchants asked the regent to open the Darjiling road; but he refused, declining to give a reason. Wohabjew did not think Tibet could long remain closed, and all the merchants would be delighted when they could come and go as they liked. The Tibetans living near the Jelap-La travelled backwards and forwards, but no Lhasa or Shigatze man can go direct to Darjiling. One of the Lamas had been on the frontier during the Sikkim row, and said he was quite aware of the power of the Indian Government, but the other Lamas had lived all their lives at Lhasa, and thought themselves all-powerful, and had no notion how weak Tibet really was. Another Lama told me that a high official left Lhasa to fight the Japanese: he cut a lot of sheep in pieces, so naturally after that the Japs had no chance, and were utterly defeated. A Tibetan announced he could cure one of our sick horses, and he poured some

medicine into its right nostril. He told us, had it been a mare, he would of course have treated the left nostril. His nostrum was a success. Many of our beasts fell sick here, and I think the one he doctored was the only recovery we had.

The people here wear such heavy earrings that, to prevent the lobe of the ear being torn by the weight, they support the earring with a strap over the ear. They rarely have a pair alike. Some of the rich Lamas had very large pearls mounted in gold, with turquoises. They wore a kind of semi-Chinese costume. Their handkerchiefs were made in the form of a sachet quilted inside, with which they simply pinched their noses; they had every appearance of being heirlooms. The boots of the common people were made of parti-coloured cloth reaching nearly to the knee, with horsehair soles knotted together with twine. Their coats are cut very long, but were strapped up short round the waist with a big fold, and only allowed to reach to the knee. At night the garment is let down to cover their legs. Most of the people slip their coats off the right arm and go about bare to the shoulder. They wear a sword stuck diagonally through their clothes, only the handle and the lower part of the scabbard being shown. Those parts are usually highly ornamented, the centre of the sword, which is hidden, being, for economy's sake, left quite plain; besides, they are armed with a match-lock gun, and many of them carry a lance in addition. The people here, both in regard to clothes and jewellery, seem to be pretty well to do; but the further west we went the poorer the people became, though even there nearly every man had a horse, and in no part of Tibet did we meet with such rags and apparent poverty as in Eastern Ladak.

Meanwhile, the Lamas were at their wits' end. We had food for a couple of months, so they could not boycot us. We had sufficient animals, and the snow-pass by which we crossed the valley was liable to be closed early in September, an event for which we were praying. Everything promised well, for they had no resource left but force, which they palpably dared not use; and, absurd as it may sound, so insecure did they feel of their position, that, though there were upwards of five hundred men camped just below us, and more above, they actually had destroyed all the bridges between us and Lhasa. The Goring Tangu valley, 16,600 feet, in which we were camped, was very wet and cold. Mrs. Littledale, who had been more or less indisposed for some months, now became so alarmingly ill, we saw it was impossible to remain here much longer. The Lamas wrote to the Deva Jung, saying that we wished to hurry through to India for medical advice; but directly the Lhasa people found that we could not stay, then their tone altered, and they reverted to their original order of "Back the way you came." I explained to them that the passes would be closed, and it meant certain death; but nothing our Lamas said would alter that determination. We could not understand why there was such a long delay between sending this

letter and the arrival of the answer, till the messenger told us, privately, that he had had to take it to all the lamaseries round Lhasa, at each of which there were meetings of Lamas. Altogether, I am afraid we caused a considerable flutter in the Lama dovecot.

Until Mrs. Littledale's illness, our prospects had looked so bright that for motives of economy we had refrained from writing and offering a bribe direct to the regent; but now I wrote, proposing to give to their temples fifty silver yamboos (1 Yamboo = £8 or £9) if they would allow us to pass through Lhasa and go to Sikkim. The Lamas with us would neither send the letter themselves nor allow one of our men to take it. We felt that things had come to such a pass that we were quite justified in taking extreme measures, so we saddled up our horses and notified the Lamas that we were going to fight our way through to Sikkim. That brought them to earth again, and they said they would supply us with everything we required, and we could go back to Ladak; to which road I consented, much to Mrs. Littledale's indignation. It was heart-breaking work, having to turn back when so near our goal, but it had to be done. I absolutely refused to go back a yard unless they first gave us a circular letter ordering all Tibetans to help and not delay us. They were reluctant, but we were firm, and they gave way. When the letter arrived, fortunately one of our Ladakis could read Tibetan. The precious document said that we must go north, and not put one foot in Tibetan territory. This we indignantly tore up and demanded another, which, after prolonged negotiations, was eventually given us. Mrs. Littledale was now so weak that riding was impossible, so we sent down to Lhasa for wood and manufactured a litter for her, and broke in some of our mules to carry it. On inquiry, we were told that there were then only two litters in Lhasa, one belonging to the Dalai Lama, and the other to the Chinese Amban. We sent polite messages to them both, inquiring their terms, but neither would sell. We thought it prudent to purchase about fifty horses, and sent to Lhasa for what we required to make up three months' supply for the party, so that we hoped to be quite independent of the natives should they prove faithless. The soap they sent us was scented, made like cucumber and tomatoes; the tobacco, Wills' Bristol Bird's Eye; so they are evidently quite up to date. They had used a queer old print of a London church some time last century to wrap up some grocery. We started on August 29 on our long march of 1200 miles to Kashmir. It being quite impracticable for mules to take the litter over the Goring La, Mrs. Littledale was carried by twenty men to the foot of the glacier. She rode a yak over the ice, and the men carried her down the rocks the other side. The work at that elevation was of such a terribly hard character, that I promised the men two rupees apiece per day if they got her over safely. The Lamas took the money, and the men got nothing. And it was just the same with

the horses and supplies; we paid exorbitantly for everything without bettering the poor unfortunate peasants one farthing. It really seemed to us that the only way to get even with these gentry would be, firstly, to vow and declare that you had entered the country by the way you really wished to leave it, and then, when they said, "Go back to whence you came," you could gracefully acquiesce; secondly, plead utter poverty: they must get you out of the place, and your not paying would affect nobody's pocket but the Lamas—the peasants, of course, getting nothing in either case.

We had agreed to go north to the Sachu Chu, the river we had crossed with our boat when going south, and then go west through Ladak; and the Lamas had promised we should have men and yak to help us, but they broke faith in this, as they had repeatedly done in other matters previously. After crossing the river the Lama and his men returned, leaving us alone. We had become so accustomed to finding our own way that we did not in the least want guides, but we did require help badly with our caravan, as two men were required for Mrs. Littledale's palki, two for the donkeys, and one for the sheep and goats; it only left five men for about sixty horses and mules, and our new animals, always having been accustomed to be led on a march, the Tibetan system, finding themselves loose, used to gallop off like mad things and scatter their loads all over the country.

Almost without exception every lake in this country has greatly decreased in size, and the process is still going on; there are lines of gravel, sometimes six or eight, one above the other, showing the height the water once had been, and marks high up along the rocks, as much as 200 feet above the present water-level, were occasionally found. On the sides of the hills surrounding the Lakor Tso the marks were peculiarly distinct. In past times the size of the lakes must have been vastly larger than at the present day. I noticed in several instances that when lakes had divided into several smaller ones by the subsidence of the water, the top of the ridge of land separating them was usually about 40 yards wide, perfectly level, and having the appearance of an artificially made dam or railway embankment. There was capital grazing in most places, the grass much resembling the bunch grass of the Western States. The country ahead promised to be easy travelling, and so it proved to be—valleys joining on to each other with gentle passes right up to the Ladak frontier, a great contrast to the country south of Cherchen, which resembles a ploughed field on a gigantic scale; and as our course unfortunately did not lie up a furrow, we had to cross from ridge to ridge. For the greater portion of the way from Zilling Tso to Ladak, our route lay to the south of that taken by Nain Sing, Captain Bower's, of course, being north of that again. We wished to have kept about 60 miles further south and traversed the Dokthol province, but feared being delayed had we done so.

We were joined by a couple of men, who said they had been sent by the headman of Senja Jong. After some days they provided yak for us to save our own horses, and we paid hire for them, which they put in their own pockets. When they left, they sent for a local official, and told him that he was to provide us with yak, and hand us over to the next district official, and then they said it was quite unnecessary to pay any hire for the animals provided. Wishing to be honest, we at first did pay; but when we found that the Kushoks, Tibetan officials, took from the yak-owners every atom of money we gave them, we concluded we would save our pockets. Occasionally an opportunity would occur of giving a little present surreptitiously. When a new Tibetan official is appointed he sends presents to his superior, which gifts have to be repeated every third year; they consist of horses, sheep, cloth, etc. The official does not give the present out of his own pocket, but everybody in his district has to contribute. On one occasion our large Turki dog went for a Tibetan dog, and, after vanquishing him in a free fight, proceeded, as was his invariable custom, to lie down on the top of his foe with his tail curled tightly on his back. The other dog gave most piteous, heart-rending howls, all to no purpose: suddenly our dog jumped up with a piercing yell, and bolted away with his tail tight between his legs, and began to bite his paw viciously. It appeared that he had knocked and held the other dog down on the embers of the cook's fire; but things bore a very different complexion when his own foot went into the ashes.

We were travelling as fast as we could, for not only was it necessary to get medical advice for Mrs. Littledale, but we were afraid that we might find the Chang La and Zoji La closed, and in consequence the mortality among our animals again became heavy. On September 22 we sighted some very volcanic-looking mountains; one was a great dome-shaped mass of black lava, and its summit was quite 4000 feet above our camp; another was streaked with red. No Tibetan is allowed to pasture his animals out of his own district; if he does, he is liable to have them seized and have to pay a fine; and nobody except Lhasa people are allowed to work at the gold mines. We passed a good many abandoned gold diggings. The work is done in summer with shovel and pan; in winter, of course, it would be impossible—the water would freeze. Previously the gold-workers had done well, but last season had been disastrous, and little gold was got. After leaving the Tengri-Nor on our return journey, we never saw but one lot of Tibetan antelope the whole way to Leh, but we passed through a grand Ovis Ammon and Burrel country; we used constantly to see them and ravine deer as we marched along.

On October 10 we saw ahead the snowy mass of the Aling Gangri. Two or three years before one of our men had been close to there trading from Leh, and recognized it, and all the Ladakis were wildly excited at

the thought of being near home. While at Chukchuka, he said, news reached the Tibetans that a sahib (Captain Bower) had passed to the north, and the intelligence was forwarded on to Lhasa. A very busy, important Tibetan arrived in camp just as we were starting, and ordered us to immediately return to the Tengri-Nor, from which point we were to be sent back to Cherchen—the way we came, only a trifle of about 1500 miles. He said it was no use talking; here was a letter from the Deva Jung, and back we must go. I made one of the Ladakis read it. It said we were to be turned back wherever we might be; nobody might help us, and we were not allowed to put one foot in Tibetan territory. It was written the same day, and signed by the same Lama that gave us our letter—a pretty piece of treachery. This old villain, the head Lama, was so very sanctimonious, that when I insisted, in the Goring Tangu valley, on having every word of our treaty thoroughly explained to me, he kept saying, "I am an old man, and shall soon die; do you think I wish to cheat you?" I showed the new arrival our letter, ordered the men to load their rifles—on doing which there was a general scattering of the Tibetan escort—our donkey-men, who had gone on ahead and had been turned back, were told to start, and the Tibetan was informed that his life was not worth a minute's purchase if he dared to make any attempt to stop them or us again. I never saw anybody so crestfallen; I really felt sorry for the fellow; he had come up a very big man indeed. Disregarding all his entreaties to stop, we marched on, and the Deva rode off to his chief for fresh instructions.

There were two ways we might have gone to Leh, one by Gar and the Upper Indus, the other by Rudok, and we were undecided which to take, when our official returned and said if he could not induce us to return we were to go by the Indus, but under no circumstances were we to be allowed by Rudok. That settled the question, and we started at once for Rudok. Not being able to carry all our things—for they declined to give us yak—we left behind a lot of stores, and told the headman that we were going to reside in the monastery until our own animals were sufficiently rested to carry all our things safely to Leh. Our Ladakis informed us that this man's predecessor in office had on one occasion gone to Leh, where he was promptly put in jail by the Wazir for having defrauded some Ladakis who had been trading in Tibet. The Deva, unfortunately, let out that he had to visit Leh on important business in the spring; that was too good an opportunity to be missed, so our men went for him on every occasion. Jail for life was the least he could hope for the instant he entered Ladak if these sahibs lost one rupee's worth of property. The threats were quite enough, and we had hardly started before they brought yak and were loading up our abandoned things.

The weather had turned very cold, and our clothes were tattered and torn. My nephew, who had worn out his nether garments, found,

like O'Brian Lynn, the hairy side of a sheepskin distinctly comforting. If we either of us forgot to take the bread to bed, we found a frozen loaf made a poor breakfast. The difficulty of dressing in the morning, with the thermometer 6°, 8°, and 10° below zero in the tent, was overcome by not undressing over-night. Wherever our breath touched the sheet was ice in the morning; and on one occasion Mr. Fletcher found that before he could lift his head he had to loosen his hair from the pillow, to which it was frozen fast. In some of the rapid mountain-streams we noticed that the water froze from the bottom. I understand the same phenomenon is sometimes seen in the Thames at Oxford.

To avoid trampling needlessly on the feelings of the people, we did not enter the town of Rudok; and the Deva's face, which had had a very anxious expression till I turned away from the town, beamed with satisfaction. Rudok is very picturesquely situated, its site covering a steep hill, which stands isolated on a plain. On the top is a large palace something similar to that at Leh, and several monasteries painted red. All the houses, which were in tiers, had once been whitewashed, but the colours had toned down, and, with the remains of an old wall round the town, the whole effect was extremely good. At the foot of the hill, about a mile away, there is another monastery. Some Ladakis trading at Rudok came out to meet us, and our men had a long talk with them. Afterwards I asked the nicest of our Ladakis whether he had good news of his wife. His answer was, "I never thought of asking." This after a year's absence! We passed some fine Mani stones, some of them very artistically carved. I annexed one, but generally when I stopped some Tibetans would stop too, so I never got a really fine one. After leaving Khotan, we found that somebody had palmed off upon us a two-year-old donkey: we tried to exchange it several times in part payment for other donkeys, but, not being able to get rid of it, we decided that it must just carry its load as long as it could. To the astonishment of everybody, it proved to be the best donkey we had; never sick or sorry, and always fat, he eventually became a great favourite. On nearing the Ladak frontier, he and another were the sole survivors of the donkeys; but, to our great regret, the intense cold finished him when close to the journey's end.

On October 27th we entered Ladak, at the village of Shushal, at which point, having completed my survey of 1700 miles from Cherchen, I put by my instruments, not without, however, a lingering regret, for, in spite of the cold, that kind of work has a great fascination for me. No names are entered on the map that have not been obtained from at least two independent sources, and the men were made to repeat the names over and over again, till we got their pronunciation right. We passed along the south shores of the Pangong lakes, whose clear waters reflected the beautiful colouring of the surrounding hills, which

showed distinctly water-marks high above the present level of the lakes.

We had a fine day for crossing the Chang La, and the snow there had been trodden solid by flocks of sheep carrying grain to Rudok. At night their loads are built up like a wall, to protect the flock from the wind, and from the walls of sacks there are ropes fastened in parallel lines, to which the sheep are tied at night, so that they can be conveniently loaded in the morning. The salt or grain is packed in two bags joined together on the top, which is placed across the sheep's back and sinks into its fleece. A rope is placed under the sheep's tail and another across its chest. The load seems to ride perfectly well, and never shifts. Two or three men will look after as many hundred sheep, each carrying 20 or 30 pounds.

Passing the monasteries of Chimrai and Hemis, we arrived at Leh, in rags and tatters, on November 2, finding quite a genial climate—a tremendous change from what we had been having. From April 26 to October 16 we had never descended lower than 15,000 feet, and for four weeks of that time we had been camped over 17,000 feet. Finding the turns on the Kashmir road were too sharp for my wife's mule litter, we took it to pieces and made a much lighter and shorter one, in which she was carried by coolies the rest of the journey. We just got over the Zoji La in time. Two days later heavy snow fell. We reached Srinagar the middle of November, where at last we obtained the medical advice which our poor invalid needed so sorely. Out of all the animals that left Cherchen, including those we purchased at Lhasa, 160 or 170 in all, only two ponies and six mules reached Srinagar; more just struggled in to Leh, but, as they were incapable of going further, we gave them to our men as backshish.

Before the reading of the paper, the PRESIDENT said: I am sure all present are delighted to welcome home Mr. Littledale, who has returned from a most adventurous expedition, having traversed Tibet from north to south, and made a very important discovery of new country; and I am sure we all feel deep sympathy with him and Mrs. Littledale in that she has been attacked by a severe illness, no doubt partly brought on by the hardships of the journey and the rigorous climate, but I trust she will, with care, soon recover her usual health again. This is the third time we have welcomed Mr. Littledale on his return from important exploring expeditions in Central Asia. The first time was in 1891, when Mr. and Mrs. Littledale returned from their journey across the Pamirs; the next was in 1894, which will be fresh in most of our memories, when he gave us a narrative of his very remarkable journey across Central Asia. Now we are about to listen to an account of the severe work he performed in accomplishing a very important geographical achievement, traversing for the first time the lofty plateau of Northern Tibet. I will now call upon Mr. Littledale to read his paper.

After the reading of the paper, the following discussion took place:—

The PRESIDENT: I am sure the meeting will be struck by the extraordinary resolution shown by Mr. Littledale in performing so remarkable a journey. A

great number of interesting points have been raised in the paper. To allude to one, I may first of all mention the flora, which, from Mr. Littledale's account, would appear to exist not at all, for he has only mentioned the *chi* grass and fuel called *bortza*, which may or may not be a plant. But, fortunately, we have present this evening Mr. Thiselton-Dyer, who has, I believe, examined the collection of plants brought back, and I trust he will give us some account of the flora of this region, for I think that the flora of these very elevated Alpine regions is always extremely interesting.

Mr. Thiselton-Dyer said that it was a happy circumstance that Mr. Littledale had been able to save his parcel of dried plants from the shipwreck which befell the rest of his collections. Its examination, which is not yet wholly completed, proved extremely interesting. It contained between sixty and seventy species, of which probably ten are new to science. "They were nearly all found in the Goring-Tangu valley (about 16,000 feet) on the south side of the high range of mountains which lie between the Tengri-Nor and Lhasa." The precise position was lat. 30° 12′ N., and long. 90° 25′ E.

One of the most striking features of the collection is the large preponderance of European genera; one might, in fact, say of British, because the large majority are represented in Britain. Out of between forty and fifty genera, there are only half a dozen of which this is not the case. Five species, *Aconitum Napellus*, *Potentilla fruticosa*, *Myriophyllum verticillatum*, *Taraxacum palustre*, and *Polygonum viviparum*, are actually found in this country. The first is perhaps an introduced plant; the Myriophyllum is an aquatic, the distribution of which is usually wide; but the two last are characteristic mountain forms with us. And in *Potentilla fruticosa* we have the most striking link between the two floras, as, though a rare plant, it is undoubtedly native in the north of England and the west of Ireland.

The flora of Western Tibet has long been tolerably well known. Eastern Tibet, on the other hand, was stated by Sir Joseph Hooker in 1855 to be "quite unknown botanically." Since this time our knowledge of the northern belt is the result of the journeys of Prjevalsky and Potanin, of Captain Bower and of Mr. Rockhill. The publication of the collections of the two former travellers was interrupted by the lamented death of Maximowicz. Those of the two latter were worked out at Kew, and the results are published in the *Journ. Linn. Soc.* (vol. xxx., pp. 131–140). Of the flora of the country between the neighbourhood of the Tengri Nor and Sikkim our knowledge is still extremely limited, and is much enlarged by Mr. Littledale's work. Sir Joseph Hooker, in two days' journey, only succeeded in collecting some fifteen to twenty species. In 1882 the Royal Botanic Garden, Calcutta, obtained some plants through a native collector, Ngyen Gyatsho, who accompanied Sarat Chandra Das in his journey to Lhasa; the collector did not, however, get further east than Gyatse Jong. In 1890 Prince Henri d'Orleans, like Mr. Littledale, attempted to reach Lhasa from the north, but apparently collected no plants in this part of his journey.

The conditions under which the Tibetan flora exists are perhaps unique. Long ago General Strachey expressed his conviction that flowering plants existed up to 19,000 feet (*J.R.G.S.*, vol. xxi. p. 77). But 18,000 feet appears to have been the highest observed level till the receipt of the collections of Surgeon-Captain Thorold, who accompanied Captain Bower. The conditions under which vegetation can exist in such circumstances are of course extreme. It is hardly necessary to say that there are no trees and no shrubs, nor any plants above a foot high. Very few indeed are above 3 inches out of the ground. General Strachey estimated that in the part of Western Tibet which he visited, "not one-twentieth part of the surface was covered with vegetation" (*Journ. Linn. Soc.*, vol. xxx. p. 101). A very large

proportion of the plants are herbaceous perennials, with long tap-roots, a rosette of leaves lying on the ground, from the centre of which springs the dwarf inflorescence.

The flora as a whole belongs to the Arctic-alpine division of the great northern region. But, as usual, this contains a purely endemic element, and also one related to the neighbouring area to the south, from which it has been perhaps recruited. Of the characteristically Tibetan plants obtained by Mr. Littledale, some had been previously obtained by Prjevalsky, Thorold, and Rockhill. Of the species not exclusively Tibetan, some extend to the Himalayas and the mountains of Western China. Of the typical Arctic-alpine flora, two species may be singled out as representative. *Lychnis apetala* extends to Spitzbergen, and there is a very interesting form of the well-known Edelweiss, *Leontopodium alpinum*, which was also collected by Mr. Rockhill. The total absence of Gentians in Mr. Littledale's collection is remarkable. It is interesting to note that the single fern collected, *Polypodium hastatum*, was previously only known from Eastern Asia (China, Japan, and Corea). Among the new species is a striking grass. Of two fungi in the collection, one is new.

The PRESIDENT: I think there are very few countries near the borders of British India with which Colonel Woodthorpe is not acquainted. I know he has been nibbling round Tibet for many years, on both sides; and as there are very few people better acquainted with the country beyond the Indian frontier, I hope he will address us.

Colonel R. G. WOODTHORPE: Rudyard Kipling, in the course of a distinguished literary career, said a few true things, but never a truer than that sentiment which he puts into the mouth of Tommy Atkins, when he says, "If you've 'eard the East a-calling, you won't never 'eed naught else." There is a fascination about the East, and such travelling as Mr. Littledale has told us of to-night fascinates all those who have ever attempted it. I have been exceedingly pleased to listen to Mr. Littledale; I have felt that what I have accomplished has been as nothing compared to his gigantic performances. But though I have done little, I have done enough to appreciate the difficulties and dangers through which he and Mrs. Littledale have passed so bravely and nobly. His anxieties about the apparently impassable mountain ranges ahead, anxieties about food and scarcity of water, and his joy on surmounting these difficulties of them, have found a responsive echo in my breast. He has borne testimony to the good conduct of the sepoys with him. It is an experience which has also been my own. In all these little expeditions I have found the native soldier, whether Pathan, Sikh, or Gurkha, always the truest and most faithful friend the explorer could have, whether on the north-east frontier, or in Afghanistan or Chitral. I have also found my sepoys keen for a fight. Once in Afghanistan I was with a small force which was sent up to turn some Afghans from a mountain-crest which commanded the camp. I happened to have got separated from the rest of the force, with one or two Gurkhas and a Havildar. There were some Afghans in a small *sungar* just ahead, and, as it was more dangerous to remain out in the open than to get in the shelter of the sungar, we rushed it. The Afghans, not knowing how small a party we were, bolted down the hill. I wanted to stop till the others came up, but the Havildar said, "I must go out and fight them." I said, "If you do, probably you will get killed." He said, "Never mind; it is absolutely necessary to cut up some of these scoundrels with my kukri." You never need urge these men on; they require, rather, to be kept back. They make it sometimes difficult for an explorer, as they are rather too anxious to fight.

Mr. Littledale told us that the Tibetans thought the telescope would enable one to see through opaque substances. That is a mistake common enough among

all wild or semi-civilized tribes. Last year, on the Mekong, I was asked by a Buddhist priest if a telescope would not enable us to see through a man's clothes to the body. He had a proleptic vision of Prof. Röntgen's discovery. I noticed Mr. Littledale observed how difficult it is to pay money to the men who really earn it. This was our experience. I remember this was the case especially in Chitral, when I made an expedition with Sir William Lockhart. Many of Mr. Littledale's pictures have recalled my experiences there, which were most happy, in company with that most generous and gallant chief and charming companion. There each morning the coolies were brought up to us to carry our luggage, but at night we were not allowed to pay them; we had to pay the head-men, who came up for the money, which never found its way into the coolies' pockets.

Sir HENRY HOWORTH: One of the facts we all ought to know is, that the President, whose modesty prevented him from telling it, has edited a very interesting book about Tibet, written by a famous traveller, Bogle, one of the few men who have reached Lhasa. This particular district is the most interesting enigma in all Asia. I have written fat books about the history of Tibet, and the tribes from the Volga to the Yellow Sea, who, whether they are remote or near, whether Mongolian or Southern Turkey tribes, derive their teaching from Lhasa. I feel that our officials put great bars in the way of Indian civilians making their way across the Himalayas, and since the days of Hodgson, who collected more real information about Tibet than any other civilian, we have never had the opportunity of entering Tibet from the south. It has always been from the north that the attempts have been made, by Rockhill and others, culminating in the journey of our friend. Let me commend to you an older authority, who knew the district well and who fought on its borders frequently, named the prince Haidar. This wonderful journey was made, and is described in an extraordinary book published by a great traveller, Mr. Ney Elias, months ago. It was written by a kinsman of the man who founded the Empire of India, and is entitled the 'Tarikhi Rashidi.' It is a disappointment to some of us that Mr. Littledale was only able to get within 43 miles of the Mekka of this Central Asiatic world; although we have accounts from older days, it would be interesting to know what life goes on there now. It is a great puzzle to know how these wild tribes and the Mongols from Lake Baikal to the Volga can understand and become attached to such an intricate and elaborate system of theology as that hidden behind the lama medium—a sort of Blavatskism gone mad. We do hope very much indeed that Mr. Littledale will make another venture, whether he takes his wife or not on such a dangerous journey. I think a man who could get within 43 miles of Lhasa would probably succeed next time. I am sure he would bring back a great many valuable lessons for us. We have hardly any notion now of what goes on there, beyond one or two accounts derived from Lamas who have found their way to Bhutan. We want some man with the power of picturesque description and also a great hunter, for Mr. Littledale was the first man to bring the wild camel to England, and those who have not seen it should go to the Natural History Museum, and see it there stuffed. You will pardon my having intervened this discussion, but I have taken much interest in this journey and the history of the country Mr. Littledale has traversed. It has been a delightful revelation to myself, and I could not help recalling to your memory that your President, with all his versatile gifts, did a wonderful thing for some of us when he edited that wonderful account of Lhasa I mentioned.

Mr. DELMAR MORGAN: I should like to pay my tribute of respect to the memory of General Walker, whose loss Mr. Markham has referred to this evening. Having been personally known to General Walker for many years, and associated with him

in some of his geographical work, I have always been impressed with his great knowledge and scientific attainments. I feel sure that the whole Society must feel his loss very deeply.

The paper we have just heard contains very many points of interest. We cannot but feel interested in the cordial reception which Mr. Littledale mentions as having been given by the Russian authorities. I am told that one of those who assisted and forwarded his journey in every way was that well-known traveller Colonel Grombchevsky, and it speaks very highly for him that, notwithstanding the disappointment he felt when exploring some years ago the valley of the Upper Yarkand, near our frontier, when he asked, but did not obtain, permission to enter British territory, he should have welcomed our traveller. Another point of view, the commercial, after what Mr. Littledale has told us, is of importance, with reference to the great trade in wool, and I think it would be a good thing were Englishmen to keep an eye on that trade. Yarkand has been for many centuries known as a trading centre, and it is from there, if I am not mistaken, that the wool from which the celebrated Kashmir shawls are made comes. From the geographical point of view, Mr. Littledale's paper is of great importance. His route—or hardly a route; it is more a track, made for himself across the most inaccessible part of Northern Tibet—lies a little to the west of the route of M. Bonvalot and Prince Henri of Orleans, and a little to the east of the journey made by M. Pevtsoff, who succeeded Prjevalsky in 1890, and who, starting from the oasis of Nia, crossed that very high range, which is known locally as Akka-Tagh, and marked on some maps 'Prjevalsky' range.

The PRESIDENT: I was anxious to discuss several geographical points, suggested by Mr. Littledale's paper, but I fear it is getting late. I will, however, say a few words respecting the chain of mountains which Mr. Littledale actually crossed, and which he mentions as throwing up peaks 20,000 feet high. I am sorry to say that on the map we have to-night that chain of mountains does not appear, which only shows how important it is that further exploration should be conducted in Tibet. I have called that range the northern range of the Himalayan system. I remember Mr. Trelawney Saunders was anxious to name it, and he has done so on a map he drew for me, the Gangri range, after the knot of peaks which connects it with the Korakoram; but Brian Hodgson has called it the Nyenchen-tang-la, as does also Mr. Littledale himself. These mountains are of the greatest possible importance and interest: they have only been crossed by native explorers and by Mr. Littledale opposite the Tengri-Nor, and in the whole length from Tengri-Nor to the Mariam La pass no one has crossed them, so far as we know. One of the last suggestions by General Walker was that a rough survey should be undertaken of these northern parts of the Himalayan system, and I believe nothing in Asia is of greater geographical importance than the exploration of this range of mountains, which I trust geographers will agree to give some name to, and next time we have a map of Tibet in this room I shall take care that they are portrayed upon it.

We now only have to thank Mr. Littledale for his most interesting paper, giving us an account of a journey which has seldom been equalled for its extraordinary hardships and the resolution with which they have been overcome. We have heard from Mr. Thiselton-Dyer that very important botanical results have come from Mr. Littledale's collection of plants, and I must express my own admiration for the splendid scientific work he has done for geography—for the way in which he got up every morning, without, I believe, missing a single one, to take observations regularly, from the time he started until he reached Leh, and his dead reckoning shows that he did his work with most remarkable accuracy. I believe it was only a mile or half a mile out in 850 miles on comparing his dead reckoning with a position

fixed by observation; 200 miles further west the dead reckoning agreed within half a mile of the longitude obtained by an occultation observed by Mr. Littledale, and compiled by Mr. Coles; and at Shushal, near the Ladak frontier, where the survey terminated, there was, after a traverse of 1700 miles, only a difference of 1½ mile between Mr. Littledale's position and that given by the Trignometrical Survey of India. We not only have to thank Mr. Littledale for an extremely interesting evening, but for the valuable scientific work done for geography, and I am sure you will all join in a cordial vote of thanks.

NOTE ON MR. ST. GEORGE LITTLEDALE'S MAP.—The instruments used by Mr. St. G. Littledale for making his route survey and fixing positions by astronomical observations were—a 6-inch sextant, a 3-inch theodolite, a telescope by Ross, hypsometric apparatus, three aneroids, a clinometer, and a prismatic compass. All bearings were taken with the prismatic compass on a tripod, and the distances were arrived at by pacing the caravan with a stop-watch. Forty-three observations of north and south stars for latitude have been employed for correcting positions, and the longitude of station 107 has been fixed by an occultation of the star and γ Capricorni by the moon. The accuracy of the traverse survey was confirmed in a remarkable degree by the astronomical observations.

THE FIRST CROSSING OF THE SOUTHERN ALPS OF NEW ZEALAND.*

By EDWARD A. FITZ GERALD.

THE South Island of New Zealand, as you all know, is long and narrow, some 500 miles in length by about 100 to 150 miles in width. It lies in a north-easterly direction at about the same distance from the equator as Italy or the Black Sea, so that the mountain ranges might be likened to the Caucasus in respect of latitude. The climate is, however, much milder; snow very seldom falls in Christchurch or Wellington even during the winter months. The whole of my work was confined between the districts of Canterbury and Westland, and the principal object of my visit was, if possible, to discover some feasible tourist route over which horses could be taken from the arid plains of the Mackenzie country to the west coast, so marvellously beautiful with its nearly tropical vegetation and its great glaciers flowing down almost to the sea. There would also be a practical use for such a road, as it would open up to the gold-diggers an easy path whereby they could get their supplies, and at the same time send their produce to the great towns on the east coast. Up to the present day they have had to rely on pack-horses led along the beach, nearly 100 miles from Hokitika—a toilsome journey even under favourable circumstances, but after a great rain, when the rivers are in flood, there being no bridges, one is obliged to stop and wait perhaps a fortnight for fine weather. As the rainfall of the west coast varies from 120 to 150 inches a year, it can be easily understood how

* Paper read at the Royal Geographical Society, January 27, 1896. Map, p. 576.

difficult it is to use this route. In the old days, when there was the great gold rush to the west coast, travellers sometimes availed themselves of the primitive method of buying some dilapidated and condemned schooner, and taking her round from one of the east coast ports to beach her on the shore, for there are no harbours on the west coast. and the surf rolling in from the great South Pacific Ocean is too heavy to permit of freight being landed by boats. The New Zealand Government have for a long time recognized the importance of finding such a passage. With this end in view, they have repeatedly sent survey parties up all the main valleys of the west coast, but with indifferent success. Mr. Douglas came nearest to finding such a route; he went up part of the Copland valley, down which I descended from my pass; but he branched off up the Strauchon glacier towards Baker's saddle, and met with impassable precipices. On his return he published an article in the New Zealand Government Survey Report, in which he said that, unless long tunnels were built under the glaciers, no passage could be made. Had he gone up what he himself named the Douglas valley, he would have no doubt met with better success, and I should not be reading this paper to-night.

I came up to my first camp in the mountains from Christchurch by way of Lake Pukaki, stopping near a small galvanized iron building called the Hermitage, set up for an hotel near the terminal face of the Hooker glacier by a company then bankrupt. The inn being closed, we had to pitch our tent beside it, and to rely entirely upon the provisions which I had brought with me, partly from Christchurch and partly from England. There is a kind of a track over which it is possible to get carts for some 50 miles from Pukaki, where the road stops, as far as the Hermitage. Bad luck overtook us on the way: the breaking of one of our axles forced us to bring all our supplies packed on the backs of horses, a task that occupied about three days.

My idea was to climb all the surrounding high peaks, and thus get a thorough knowledge of the country. I was so fortunate as to have with me Mattias Zurbriggen, foremost amongst Swiss guides, who had just returned with Sir Martin Conway from his famous Indian expedition, the exploration of the Karakoram Himalayas. As to the Alpine climbing part of my expedition, I will not dwell here on our many difficulties and obstacles, nor on our hardships from want of provisions and porterage, as it is almost impossible to find in New Zealand a man who will trust himself upon a glacier. It suffices to say that on January, 29, 1895, we scaled Mount Sealy (8631 feet) after four weeks of continuous rain. Next we reached the summits of Mount Tasman (11,475 feet), the second highest mountain in the colony, Mount Haidinger (10,107 feet), and the Silberhorn (10,250 feet); and finally, on February 15, after many attempts, we attained the topmost point of Mount Sefton (10,359 feet), the Matterhorn of the New Zealand

Alps. It was from this peak that I first saw a passage by which it seemed feasible to cross the ranges to the west coast, and a few days later, on February 19, we made an expedition up the Hooker glacier in order to choose what might appear to be the best route.

During the succeeding ten days, the weather being extremely unsettled, I spent some time making smaller expeditions about the various creeks and gorges of the Hooker and Tasman valleys. On these excursions I noticed several small growths of the obtuse-leaved *Fagus Cliffortioides* (the white birch of the settlers). This I found growing in many spots along the Tasman valley—indeed, almost up to the terminal moraine of



THE TASMAN VALLEY, LOOKING TOWARDS THE HOOKER.

the Hooker glacier. The vegetation was not confined to the *Fagus*, but included the *Plagianthus Lyalli* with its white blossoms, several sorts of dwarf conifers, such as *Podocarpus nivalis* and *Phyllocladus Alpinus*. At the snout of the Tasman and Hooker glaciers and elsewhere I found the *Aciphylla Colensoi* (the "wild Spaniards" of the settlers) growing in dense thorny masses, and forming an almost impenetrable barrier to our advance. Another conspicuous type of Umbelliferæ is the *Ligusticum Haasti*, covering the hillsides with its delicate feathery leaves. On the lower slopes of Sefton, great beds of the *Ranunculus Lyalli*, the "shepherd's lily" of the settlers, flourish luxuriantly at an altitude of 4500 feet, the great orbicular cup-shaped leaves filled with morning dew.

Several species of Dracophyllums were conspicuous, among which I note the *D. uniflorum*, which abounded around the Hermitage, and the

D. muscoides, which forms a carpet with its low tufts on the higher slopes up to an elevation of 6000 feet. The white-berried *Gaultheria* was also plentiful.

There were many species of *Senecio*, *Gnaphalium*, and *Olearia*; also numerous species of *Veronica*, *Geum parviflorum*, and *Coprosma fœtidissima*. *Coriaria thymifolia* grew in profusion, with its deeply veined leaves and large black berries. Along the watercourses I noticed *Epilobium crassum* and *E. confertifolium*. The proximity of the Alpine to the sub-Alpine species is very marked.

Traces of an ancient glacial period can be seen all down the Tasman valley as far as Lake Pukaki, at the head of which I noticed many mounds of morainic matter, evidently terminal in their form. Remains of many lateral moraines exist all along the valley. In the whole of my explorations, I did not come across anything which would point to a volcanic period. The general aspect of the valley is rendered extremely barren by its immense watercourse, for the stream frequently changes its channel, thus giving its bed a width of a mile or more.

It was not till February 24 that I set out alone with my guide, Zurbriggen, to cross the divide. The weather now looked settled—that is, as settled as weather can look in New Zealand, for I have seen it suddenly change completely in half an hour, the barometer standing high. We started at 5 a.m., taking with us a couple of 40-lb. packs, containing photographic camera with one hundred exposures of Eastman's films, a few pieces of mackintosh sheeting to cover us at night, and a pot to heat water in; these, together with surveying instruments, writing and sketching materials, some dry clothes, and over a hundred feet of rope, left very little room for provisions. We managed, however, to squeeze in sufficient for a day's consumption. We went up the right bank of the stream to the Hooker valley, walking along the east moraine till we were nearly under what is known as the Ball pass. This leads over to the Ball hut on the Tasman side, a small refuge built by the Government on a bit of land between the Ball and Tasman glaciers. While crossing the Hooker glacier, the mists and clouds in the valley cleared as the sun rose, and the three peaks of Mount Cook, with their great crags and precipices, towered some 10,000 feet above us. We paused to admire the view, when a number of New Zealand Keas (*Nestor notabilis*, a kind of parrot) surrounded us, screeching in a most deafening fashion. These birds live almost entirely in the mountains above the forest lines, and in certain regions they prey on the sheep, lighting on their backs and pecking out their kidney fat. It is believed that they have learned this habit of meat-eating from the offal thrown out from the sheep-runs after an animal is slaughtered. It is incontestably a fact that in certain valleys they have not learned this trick. They are a handsome bird, with brilliant plumage of a dark green colour, the inside of their wings from the level of the pinion being of a

ruby tinge; beneath this bars of bright yellow run across the feathers. They have a most powerful beak, the upper mandible of which is more curved even than in the case of a parrot, and their small black eye gives them a cruel expression. I have found them so tame at times that I have been able to catch them in my hand, especially in unexplored districts where they have not as yet learned to fear man.

We now followed up an old torrent bed, under the saddle towards which we were making, as far as a long gully filled with avalanche



LOOKING DOWN TOWARDS THE MARCHANT VALLEY FROM FITZ GERALD'S SADDLE

snow. Here we took to the rocks to the left, but, as they were very bad and crumbling, we cut across the gully and scrambled on to the ridge to the right. By taking the next ridge but one we should have escaped all difficulty in the ascent, but the way would have been slightly longer. As it was, we chose the shorter but more troublesome route. At the top of this ridge was a small snow dome, whence our saddle was plainly visible. Proceeding round the base of this, we cut straight down to our pass across a small glacier, reaching it after about twenty minutes'

easy walking from the snow dome. I made out the height of this pass to be roughly 7180 feet above sea-level. The New Zealand Survey Department have named this the Fitz Gerald pass. In many ways it resembles the Monte Moro in Switzerland, leading from Macugnaga to Mattmark. There would be no difficulty in building a bridle path from the Hermitage to this saddle, the snow part being short; while on the west coast side an easy slope of loose stone leads into the Marchant valley, presenting no obstacle to the construction of a path.

Clouds now began to gather again, so we hastened to descend, fearing lest we should be overtaken by bad weather before we could find our way down to the valley. Soon we got down over a succession of easy grass slopes, and, bearing off to the left, reached the Douglas river by 4 p.m. We at once began to descend the valley along the south bank of the river, hurrying on as fast as we could, and keeping close to the river-bed, determined to make as much of the remaining daylight as was possible. Soon the walking became so rough that it was necessary to go farther inland, and to take to the dense scrub on the mountain-side. We tried to creep under it, but, finding this hopeless, endeavoured to crawl over it. This proving equally impossible, our only course was to fight our way bit by bit, lacerating clothes, hands, and faces, only to discover, after an hour's hard work, that we had progressed 150 feet! At this rate we should starve before getting out of the valley; so we returned to the river-bed again, where, by difficult climbing, we managed slowly to work our way over the boulders. It was tedious work and very fatiguing. At 6.30 we bivouacked for the night near a big stone by the river-bed, and at daybreak were off, and once more at the fearful business of climbing over the big stones. About 9.30 we reached the meeting of the Strauchan and the Marchant streams, and flattered ourselves that the worst was over; but, as a matter of fact, it was only about to begin. We had now literally to fight our way down, sometimes over and sometimes under great boulders, with an occasional small *détour* through the forest scrub, where over an hour would be spent in going a distance of 20 or 30 yards. The whole valley was deeply wooded high up on both sides and down to the river; there was but one way through, and that was the river-bed. At 11.30 we started down, but soon had to turn off into the dense forest of scrub, the river closing in here into a sort of gorge, with huge boulders piled up one on the top of another across it so as to form species of bridges, while the stream, now a raging torrent, rushed below in a series of cascades. We forced our way through the maze of creepers and underbush, the walking not being quite so bad now, as we were gradually coming to the regions where large trees grew, such as cedars, totaras, and the rata tree, so frequently found on the west coast of New Zealand—a very hard wood, but, as we found, extremely useful for camp fires, as a log of it will smoulder for days when once properly lighted. We were continually stopped by long

rope-like creepers that wound themselves about us in a curious fashion—supplejacks, as they are called on the west coast (*Rhipogonum scandens*). There were also prickly tendrils named lawyers (I suppose, when fastened to one they never let go).

At 2 p.m. we reached the end of the gorge, where the river widens out as it approaches the Welcome flats. These form a sort of plain about 2 miles long by half a mile wide, evidently formed of old glacial



LOOKING DOWN THE COPLAND RIVER, SHOWING WHERE THE GORGE CLOSED IN.

deposit. The Copland river here opens out, wandering about over an extensive bed, and forming what might almost be called a lake. The flats are certainly well named, for never was a place more welcome to the weary traveller than this expanse of level ground.

We found many species of birds on these plains, among others the blue mountain duck (*Hymenolæus malacorhynchus*) and the Paradise duck (*Casarci variegata*); also the Weka or Maori hen, as they are called on the west coast (*Ocydromus Australis*), a curious kind of wingless bird

about the size of a pheasant. They are to be seen almost all over New Zealand in uninhabited parts, and are of a very mischievous nature, stealing anything bright that they can find. While we were in camp we missed many things, which we afterwards discovered had been taken by these birds. All the birds here were so extremely tame that Zurbriggen undertook to catch some of the blue duck. It was a comical sight. They would let him approach to within a couple of yards of them, and then fly off, only to repeat the same game a few paces farther on. As we had no more provisions, we should have been glad to catch one of these birds, but it was not to be.

From this point there was a fine view up the Ruera valley to Lyttle's peak. We continued on past the flats, and commenced to descend another gorge, scrambling amongst the huge boulders along the river-bed, or tearing our way through the scrub. Here were some of the largest erratic boulders I have ever seen, one proved, on measurement, to be about 300 feet by 200 feet by 100 feet, whilst others seemed even larger. I observed a rata tree growing on the top of one of these, together with some stunted scrub; they were all covered with mosses. At 6.30 it became so dark that we were obliged to bivouac among some big boulders. As the weather looked promising, we did not think it necessary to protect ourselves from rain; but no sooner had we lit our fires and made ourselves comfortable, than it commenced to pour. The rain continued to fall through the night. At 6.30 A.M. we determined to start, thinking it best to advance as far as possible, and, in case the rain continued, seek out some more comfortable bivouac where we could await the fine weather, should we be unable to ford the river. The work was now both dangerous and most unpleasant, for it was almost impossible to keep our feet upon the slippery, wet, water-worn stones, while had we lost our footing we must surely have been drowned, so great was the force of the torrent beneath. The river here runs through a narrow gorge, where we were forced to keep to the banks; but the underbrush was not quite so thick, and we made better time. About two in the afternoon we reached the end of the gorge, and could walk in relative comfort along the river-bank. We passed Architect creek, and came into more open country with many tracks of wild cattle.

We now looked about for a ford, as the river was high, and the sooner we crossed it the better. For a long time all places seemed hopeless, but by five o'clock we reached the point where the river began to spread out over its banks, and in consequence flowed less rapidly. It was not an inviting place, but I determined to try it as our best chance of reaching some habitation that night. After several trials, and with much difficulty, we succeeded in crossing. We stopped for a few minutes to wring out our clothes, and then walked down the river-bank, which was fairly level. In about an hour we passed the place where the Karangarua river joins the Copland river. A little farther

on our attention was arrested by the sight of a fresh footprint in the sand. Our astonishment was great. We silently walked on, neither of us making any allusion to the matter till we reached what appeared to be a freshly cut track through the forest—another surprise! As it was in the direction we wished to follow, we started along it, thinking thus to strike what we thought would be the south road. It was not till later that we learned that no such road exists except on maps.

It was rapidly growing dark, and, although we strained every nerve in the hope of getting through the forest before night, we were at last forced



SHOWING THE CLIFF PRECIPICES COMING DOWN TO THE VICTORIA GLACIER, WITH DAN THE MAORI IN THE FOREGROUND.

to stop, after several falls over trees and into dark holes. We lit the pocket-lantern carried by all Alpine climbers, and resumed our march. We had scarcely proceeded half a mile, when we saw before us a blazing fire and a large tent looming up so suddenly that we were startled. A moment later we heard the gruff voice of a man from inside the tent, and soon he emerged, as much surprised at the meeting as we were. He could scarcely comprehend where we came from, but I gathered from him that the camp was Mr. Harper's, one of the Government explorers, who had just returned from the Twain river, and was now with Mr. Douglas at Scott's homestead, about an hour's walk further on, but difficult to find in the dark. At last, after wandering about in an intricate maze of paths, we stumbled suddenly upon the house. Here they at

once gave us food, of which we stood in great need, after marching three days from the Hermitage with only half a day's provision.

Next day was spent at Scott's house, in making plans for the return journey. There were also some elaborate patching operations to be performed on our clothes, which were nearly torn to pieces by the journey down the Copland. After due consideration of the possibilities of the return journey, I decided to set out the next morning by way of Gillespie's Township, and thence to go up to the foot of the Fox glacier, and return to the Hermitage by a route traversing as many of the glaciers in that direction as possible, in order to gain as much topographical knowledge of the district as I could. The south road not existing, or at least being so impassable that it gave Mr. Douglas three days' hard bush work to travel 7 miles along it, there was no choice for us but to follow down the banks of the Karangarua river to the sea. Then we must ride along the beach, swimming the horses across the Cook river, and so reach Gillespie's Township, whence I was told I should find the road to Sutter's house (formerly called Ryan's), and the foot of the glacier a couple of hours further on. Mr. Scott promised to furnish me with horses, and to let me have the use of a young Maori employed on his farm, by name Dan Te Koeti. We decided to make an early start, as they told me it was impossible to get round the beach at high tide.

On the morning of February 28 we set out about 7 a.m., every possible obstacle having turned up to detain us. It was more than an hour later than we intended. Our party consisted of five, Mr. Harper having joined us. We rode down the Karangarua as fast as our horses would take us, and at 10.30 we reached the sea. The day was a fine one, although very cloudy in the morning, and the surf was already rolling in heavily, so that there was no time to spare, for the strip of beach here is very narrow, and completely covered by the high tide. The beach is at the foot of perpendicular cliffs at least 100 feet in height, in places forming species of bluffs, which I believe to be nothing more or less than ancient terminal moraine-heaps, eaten away by the sea into steep precipices. Probably, therefore, a great glacier once flowed down the whole length of the Karangarua valley, throughout which it is easy to find traces of ancient lateral moraines and glacier action. It seems to me very possible that at one time a great mass of snow and ice may have flowed off Mount Cook over Baker's saddle, which, being only 6300 feet high, and at the present moment not more than a few hundred feet from the Empress glacier, may at one time have formed a channel through which the overflow of ice coming from the slopes of Cook may have poured down into the Strauchan valley, thus greatly augmenting the flow of ice down the Copland, and forming a great glacier to the sea.

Riding along under these cliffs, we passed by a small bay where gold-diggers were at work on the sand. These men scrape together a

scanty living by washing for gold the black sand thrown up on the beach after a storm, the old deposit of the river-bed. They stared at us as though we were an apparition, the presence of a stranger on this coast being an almost unique occurrence. We reached what is called Salt Water creek just as our narrow passage along the beach threatened to disappear altogether before the advancing tide. The passage of this narrow stream is exceedingly dangerous by reason of the quick-sands, and the outlet changes with the tide. Two men have of late years lost their lives in the attempt. The salt spray of the breakers



MOUNT TASMAN, FROM BLACKBURNE'S SADDLE.

already dashed in our faces, and now and again a wave would roll in up to the horses' feet. Seizing the opportunity of a huge receding wave, we dashed safely across, and passed the bluff which Captain Cook fixed trigonometrically with his sextant when he first landed in New Zealand, and which has ever since been the fixed point for all coast survey. We thus reached the mouth of the Cook river, where an ancient character known as California Bill plies a ferry. Taking the horses in tow, we just succeeded in getting across as the boat seemed on the point of sinking under us.

Gillespie's Township was reached by about one o'clock, and we halted

at what is by courtesy called the Gillespie's Beach Hotel. The township consists of some three houses, each a combination of a public-house and a general store for all species of merchandise. The majority of the population seem to consist of children under ten. Gold-digging is carried on here, but they mainly re-wash the sand that was roughly sifted in the first gold rush to the west coast. In the afternoon I visited a dredger set up by a company for washing gold at an original cost of £7000 or so; it has not, however, been found to pay, chiefly, I suppose, owing to the great cost of transportation, all the machinery having been brought down on pack-horses from Hokitika. As we were visiting this dredger, the peak of Mount Cook became visible for an instant above the clouds that had shrouded the hills throughout the day, and formed one of the most superb spectacles conceivable, towering up to a height of some 12,000 feet, and only about 15 miles distant. I now decided to ride on to Sutter's, telling Zurbriggen and the rest to follow as soon as some provisions we were having prepared should be ready.

About ten o'clock next morning we set out for the Fox glacier; but, upon reaching a spot near its snout, we found the weather so threatening that we deemed it more prudent to halt and camp in the woods close by and await better conditions. It poured the whole afternoon and evening. When the night came on, we packed ourselves like herrings in a barrel and tried to sleep, in spite of the sand-flies and mosquitoes that buzzed about us continually. Next morning, though the rain had ceased, we were still enveloped in dense mist. Towards evening the weather cleared, and on the following day, after another night of general misery and discomfort, we started up the Fox glacier. It was slightly misty at first; but then, if one were to wait for an absolutely fine day in these districts, one would have to build a house and stock it with provisions for a year. About seven in the morning we reached the terminal moraine of the Fox glacier. A few minutes took us over it and on to the ice. This glacier is unusually smooth, and unlike its neighbour the Franz Josef, which is so broken as to form practically a huge icefall from top to bottom, a distance of some 7 miles. The Fox fills its bed completely, so that it was possible to walk on to it from almost any point; but in some places, where it had sunk from its old level, and the sheer rock rises in perpendicular precipices, one can stand on the glacier and lean against the rock as against a wall. The result is that there are practically no lateral moraines, but the glacier sweeps down all its *débris*, which accumulates in one huge terminal moraine at its snout, only some 680 feet above sea-level, and only about 8 miles from the actual beach.

We walked up the ice for about 2 miles, keeping to the south side till we came to the first icefall before the Chancellor's ridge. Here we left the glacier and scrambled along the rocks at its side, which form the nearest approach to a lateral moraine that I saw upon this glacier; but even this seemed to be gradually swallowed up and

carried down by the glacier. About eleven o'clock we reached the plateau above the icefall and, regaining the glacier, crossed it at the bottom of the Chancellor's ridge. Here we scrambled up the rocks towards a little cascade which bears down the overflow water towards the Victoria glacier. The mists having lifted by this time, and the sun making its appearance, I decided to send back Dan the Maori, lest, if I should take him any farther, he might be unable to get back over the glacier before nightfall. We stopped some time, discussing what route we should follow next day to reach the Tasman valley. Anxious to see



THE HEAD OF THE FRANZ JOSEF GLACIER, FROM BLUMENTHAL GLACIER; MOUNT ELIE DE BEAUMONT.

the great head basin of the Franz Josef glacier, we decided to go up to the Victoria glacier and to seek some feasible pass thence across the range between the two glaciers. Accordingly we scrambled up the rocks towards the Victoria glacier, intending to camp as high upon the Chancellor's ridge as we could that evening. The weather as usual became threatening, and we heard the distant roll of thunder from some heavy clouds banked up towards the north-west. Large drops of rain fell, and by the time we reached the terminal face of the Victoria glacier we were forced to seek shelter for the night. Disbanding, we commenced a search, and presently discovered an overhanging rock

overlooking the foot of the Fox glacier. Here we decided to shelter until the storm should pass. We spent a miserable night. Toward three o'clock in the morning I changed the roll of films in my camera by way of occupation. I always carry a changing-bag for this purpose, but my fingers were so numb that it took nearly an hour to do what I usually accomplish in five minutes. Next we concocted a beverage which we called cocoa by help of a fire made with the remnant of the scrub we had used the night before, whereon we boiled, or rather I should say warmed, about a pint of water. This warmed us a little, and by 4.30 we felt ready to start. Lighting our lanterns, we followed the moraine for about half an hour on the right-hand side of the Victoria glacier; then turned to the left and struck across the glacier itself. By this time dawn was approaching fast, and we were able to look about us and decide upon some feasible route. Before us lay a range of mountains dividing the Fox and Franz Josef glaciers, and between these mountains were a series of passes, for the most part apparently impracticable, on account of the nature of the overhanging glaciers that came down from them on to the head basin of the Victoria glacier. There seemed, however, to be almost directly north of us a pass which we thought would lead to the Fritz glacier, between what we named Mount Gaskell and Mount Anderegg, on the dividing range of the Fox and Franz Josef. From this pass, which we named Blackburne's saddle, we saw, leading straight up to the divide, a kind of arête, which we thought we could manage, even though covered with the newly fallen snow of the previous evening, if we were unable to find what we hoped, namely, an easy snow-slope leading from the head of the Fritz glacier directly over to the Franz Josef between Mount Roon and Mount Anderegg. We therefore at once started for this Blackburne's saddle, to which we mounted without much step-cutting, as the fresh snow had frozen and we could trust ourselves to it. At 7.30 we reached this pass, after crossing some very nasty crevasses. The sun had now risen, and we were confronted with a most glorious view. The west side of Mount Tasman showed itself to us in great perfection, with its rock precipices rising some 6000 feet out of the head of the Fox glacier. Behind us the Fritz glacier, almost on a level with our saddle, flowed down towards the sea. We were the first to explore the head of this glacier.

We now proceeded to follow up the rock arête that led towards the divide. After following it for a little, we cut off to our left, and began to mount the Fritz glacier, which, as we anticipated, led by an easy slope to a snow saddle eventually christened Zurbriggen's saddle. All went smoothly for a while until a huge crevasse seemed to cut off our advance from every side, and as clouds now began to gather, fearing lest we should not be able to reach a point from which it would be possible to see a route across the head of the Franz Josef,

we turned back to our ridge, knowing that from it, by patient climbing, the saddle we had in view was attainable. We hastened on, and at about half-past ten reached Zurbriggen's saddle, some 7160 feet above sea-level, as I made it out. Here a sort of snow dome cut off our view; so, proceeding round this, at eleven o'clock we reached a ridge between the Blumenthal and Melchior glaciers, from which we got a most magnificent panorama of the huge basin at the head of the Franz Josef glacier, with the great peaks of Elie de Beaumont, De la Beche, the Minarets, Glacier peak, and many others standing out in the clear atmosphere as if quite close, though in reality several miles away. The chief



GRAHAM'S SADDLE, FROM THE EYRE GLACIER

object, however, that attracted our attention was a huge precipice at our feet with no visible way down it. To pass around it would have involved descending the almost impossible icefall of the Blumenthal glacier, an operation that would have taken at least six or seven hours, and thus forced us to camp for the night on the ice. The rocks on either side seemed absolutely sheer, and we seemed doomed to have to take recourse to some desperate remedy, when Zurbriggen, who had untied himself from the rope and had been searching about for some way down, shouted to us to come to him, apparently at some impossible place under our feet. After a little difficulty we reached him, and found that he had discovered a couloir or small gully filled with ice, which he thought "would do." By mid-day we had passed the worst of it, and were able to get upon the Anderegg glacier, after crossing some tremendous crevasses. We cut straight across this glacier to a ridge separating it from the Agassiz glacier. We crossed the whole of the latter, and soon reached a glacier

which flows down from what is known as Graham's saddle. This we called the Eyre glacier.

We were so thirsty by this time that we could no longer endure our suffering, and stopped to see if it were not possible to melt some snow on a bit of black mackintosh sheeting which we still had left to us, thinking that the sun, being attracted by the black, would heat it and thus liquefy the snow. At the same time, with the help of an old treacle-tin and an old candle that we cut into half a dozen pieces, we improvised a species of "Etna," and melted about a cupful of water mingled with lumps of treacle. These operations lasted nearly an hour, and we were conscious that every moment was precious if we wished to get off the glacier before nightfall, but our thirst was such that we did not care what happened so long as we obtained a few drops of water.

It was not before six o'clock that we were again under way, and by about a quarter-past six we stood upon Graham's saddle, the dividing-line between Westland and Canterbury, and looked down into the familiar Tasman valley. Descending and climbing on to the rocks of De la Beche, we took off the rope that we had worn on the glacier, and rushed down over the loose rocks, hoping to reach the Rudolf glacier before the light should fall. We were nearly down, when Zurbriggen fell and sprained his ankle, so that it was painful for him to walk. It was growing dark, and we had to light our lanterns, trying thus to get down the last few hundred feet; but Zurbriggen fell again, this time through a crust of snow bridging over a little stream, and so hurt the other ankle that he was nearly crippled. The rope had again to be put on, for the rocks were steep and glazed with ice. A hundred feet only intervened between us and the Bergschrund, which separated us from the Rudolf glacier, which we knew meant comparative safety and comfort; but now Zurbriggen hurt his ankle for a third time, while all the photographs, sketches, and notes that I had taken since the ascent of Mount Sefton dropped out of Harper's knapsack and whizzed past me into the Bergschrund. I made one frantic effort to snatch them, nearly losing my footing and rolling down after them in the attempt. I saw that there was nothing for it but to spend the night out here on the ice-covered rocks; so calling back Zurbriggen, who was trying to get down the absolutely sheer glazed rocks, we retraced our steps some 50 feet, to what seemed the most suitable place to spend the night. This was a ledge about 4 feet long and 18 inches broad, on which the three of us could just manage to sit. No sooner had we settled ourselves here than I heard the whiz of falling stones. This was the commencement of a cannonade that was kept up at intervals throughout the night. Sometimes rocks flew past us so near that we almost felt the wind from them. We never dared so much as to close an eye all night, for fear of slipping off into the abyss below. The cold became intense, the thermometer dropped to 25°, and, as most of our garments had been soaked in

wading through the melting snow during the day, our things froze hard.

With the dawn we were preparing for departure, but everything was frozen stiff. Our rope was like an iron bar, and our clothes would not give to our motion at all. Harper's boots were frozen so tight that he had to cut them open, and burn innumerable candles inside before he could get them on. We crept slowly down the rocks, and found that we were much nearer the glacier than we had supposed; also that that we had taken for a crevasse was nothing more than a heap of stones. In ten minutes we reached the glacier, where I found my photographs and papers, which had been caught up in their downward course by a projecting ledge of ice, and thus saved from a deep hole leading down to some water, into which had they fallen they would certainly have been lost for ever. We were very stiff, and could scarcely walk at all, but the sun soon thawed us, and at 10 a.m. we reached the Ball hut, where we were detained nearly a week by torrential rain. Thus ended our journey back from the west coast. In returning we had crossed ten of the great glaciers of New Zealand in three days, including the three biggest—the Tasman, the Fox, and the Franz Josef.

In conclusion, I will say that, owing to the nature of the climate and the impossibility of getting porterage, explorations in the Southern Alps of New Zealand are attended with many hardships, and, from the fact that there is no really reliable map of the glaciers, if a traveller is caught in certain places with fogs and mist, it would be almost impracticable for him to extricate himself with an aneroid and compass, as Sir Martin Conway proved it possible to do in the European Alps, when he performed his journey of 'The Alps from End to End,' on which expedition I was so fortunate as to be with him, and to learn the practical application of his method.

Before the reading of the paper, the President said: Our attention this evening will be turned to the Southern Alps of New Zealand. This Society has, during the last fifty years, received various communications regarding that splendid range which Captain Cook called the Southern Alps. I think it is nearly fifty years ago since Mr. Brunner made explorations in the northern part of the west coast, and sent home a very full paper, which induced our Council to present him with one of our awards, as a recognition of his valuable geographical services. We have also received a description of their appearance from the west coast, from Captain Stokes, of H.M.S. *Acheron*, after whom one of the peaks is named; but I think the first traveller and explorer who actually reached the glaciers was Dr. Haast, and his companion Dr. Sinclair, who was carried away to his death by one of those glacial streams, the first martyr to science in New Zealand. I am sure all those who are present will remember with pleasure the charming and interesting paper read by Mr. Green a dozen years ago on the ascent of Mount Cook, the highest peak of that range, supposed, before his ascent, to be inaccessible. I am glad to be able to tell you that he is present this evening. Our last communication was

from Mr. Harper, the young secretary of the New Zealand Alpine Society, who treated of the glaciers in a general way, which have been carefully described to us on more than one previous occasion. Now I believe we are to hear not only of the glaciers, but also of the discovery of the first, and probably the only practicable pass across that formidable snowy range of mountains. I will now call on Mr. Fitz Gerald to read his paper.

After the reading of the paper, the following discussion took place:—

Sir Westby Brook Perceval, Agent-General for New Zealand: I have only got one fault to find with our President, and that is, he gave me no notice of the demand which he has just made, that I should say a few words on the paper we have just listened to. However, I think it would be extremely ungracious on my part if I did not accord to Mr. Fitz Gerald my thanks, and, I think I may add, the thanks of the colony of New Zealand, for the very valuable services rendered to us, in the discovery of a mountain pass for tourist and other traffic. You have gained from the beautiful slides some idea of our scenery. We look upon our scenery in New Zealand as one of our most valuable assets. It is so in more senses than one. It is owing to the snow-ranges that the country of New Zealand possesses such an ample rainfall, and such a fertile soil. I almost regret that our empire possesses so few glaciers and snowclad ranges. I think, if we could put a snowy range down the centre of Africa we should do a very fine work. I thank Mr. Fitz Gerald most sincerely for his paper, and am extremely glad to have been present to-night to hear it.

Rev. W. S. Green: It is with the greatest possible pleasure I have come here to-night to realize a dream of my own of fourteen years ago, when I was in the New Zealand Alps. For the last twelve or thirteen years I have taken a great interest in the explorations carried on by New Zealanders themselves, who have pressed on in a most marvellous way. Considering the population of the country, that population has produced a large number of climbers, and they have worked assiduously there ever since; but certainly Mr. Fitz Gerald's work has been like the reaping of the harvest. Even as the harvest is greater than the seed-time, so his work is the greatest done in that country. He passed over very lightly the difficulties of that terrible passage down the Copland valley, which I can appreciate, from having had to force my way through scrub and take our packs through it before the track was cut which now exists to the foot of Mount Cook. There must have been a great deal more of it down the Copland valley, in those deep cañons lined with bush, and with nothing but a smoke of tobacco to carry him along. These three days represent much more than he has given us any idea of. When I went out, we had some little difficulty in getting at Mount Cook at all, and when we did, only reached the top at half-past six in the evening, and, to save our lives, left the last little bit unascended. I was very sorry afterwards I did not push on. I think if we had we should have reached it; but we had gone for twenty-two hours without any food, and between that and the unpleasantness of being on the top of a mountain at night, we turned down. I was sorry at leaving that little bit undone; but I have had reason to be glad ever since. It has stimulated the New Zealand Alpine Club to the most superhuman exertions to manage that piece, and the result has been that they got up this year, Mr. Graham, Mr. Fyfe, and Mr. Clarke, by an entirely new route, and reached the summit. I consider that if I had done that little bit which I left undone, I should have taken away a great incentive to Alpine climbing in New Zealand.

On looking at this map which has been put into our hands, I see one thing which is particularly interesting. When I read my paper a long time ago, I remember speaking of some of these glaciers coming down close to the sea, which is a

remarkable fact, the Fox glacier coming down to within 600 feet of the sea—so far as I am aware, lower than any other surveyed. When I spoke of that here, Mr. Freshfield said, "The probability is, that the basin must be extraordinarily large." Now, if we look at the map, we see the nevé basin is very large. The supply of ice is enormous, enabling the glacier to reach far down. The immense rainfall in the Southern Alps keeps up the supply of ice. It has been to me a very great pleasure indeed to hear Mr. Fitz Gerald read his paper to-night, and the only way I can show this is to say that I left Dublin this morning in order to be present to hear it.

Sir W. Martin Conway: I have never been in New Zealand, and I am afraid any remarks I might make about the country and its mountains would be wide of the mark, I was very much struck by the admirable photographs which Mr. Fitz Gerald has taken, and which I regard with envy. They were taken with the same camera that I had in the Himalayas, and which in my hands performed a remarkable journey, viz. falling down a hillside for half a mile, and being dinged into holes, so that when I took a photograph it was like playing on a flute, so many were the holes to be stopped by fingers. I remember the photographs I was able to take, and, comparing them with these, I regard these with fully as much envy as admiration. In looking at these views, what occurred to me was that the New Zealand Alps in their snowy mantles are different from any other mountains I know, entirely different to the snow covering of the Alps. If anybody who is familiar with the Alps were to see these photographs, he would know at once that he was in the presence of an entirely different kind of mountain, because all the snow-slopes we have seen, all the glaciers, are as it were laden and overborne with snow. The glaciers bulge over and force their way down with an energy you do not see working in Alpine or Himalayan glaciers. That weight on the glaciers, overburdened by snowfalls, brings the Fox glacier down to within 600 feet of the sea, the unusual snowfall doubtless corresponding with the great rainfall of 150 inches in the plains below. This creates a new set of conditions for the mountaineer, and for Mr. Fitz Gerald to be transported into these new conditions, and to carry through a journey of such importance and achievement as he has done without misfortune and accident, is a very great proof of his ability as an explorer. Indeed, I would go further, and say that it has occurred to me, as Mr. Fitz Gerald read his admirable paper, and showed his excellent slides, illustrating what he has done, that possibly we were brought to-night into the presence of the man who is to be identified with the greatest remaining unexplored region of the world outside of the polar regions. For, leaving the polar regions out of account, the only great and important parts of the world unexplored are the mountain ranges. They are barely touched, and it remains for the coming generation to bring them into the area of the known. When we see before us a gentleman, who (I think I violate no confidence when I say it) is probably young, and who has shown such extraordinary ability as he has, in dealing with mountain-exploration, I think we may foresee in him one of whom we shall hear more in the future.

Mr. Claude L. Barrow: It is with some hesitation that I undertake to speak before such an audience as the one before me, but I feel, to some extent, justified by the fact that I was with Mr. Fitz Gerald throughout his stay in New Zealand, and I had then every opportunity of observing and admiring his methods of exploration, and the great patience he showed in the face of obstacles which, I think, might well have deterred many a more experienced explorer. I, for one, can testify to his unfailing cheerfulness and resolution in the long rainy weeks we spent together in our little camp outside the Hermitage. One of the great difficulties Mr. Fitz Gerald experienced was that of the transport of provisions. It is almost impossible, in

fact I may say it *is* impossible, to get any one in New Zealand to act as porter upon the glaciers. Mr. Fitz Gerald solved the problem by not carrying any provisions at all, as you will have heard in his paper to-night. This was a ready way out of the difficulty, but one which, I think you will admit, few would care to try. During my stay at the Hermitage I had a chance of observing the infinite variety of plants and animals of these regions. The flora is really very beautiful, combining to a certain extent what we are accustomed to think of as alpine with the richer vegetation of the lower regions, and I am sure that there is a great field here for botanists. The birds, too, are wonderful, especially the kea parrots. The intelligence of these birds is quite extraordinary; their curiosity is easily roused by any strange object, and whenever anything puzzles them, they seem to hold a sort of informal meeting, one standing in the centre and haranguing his fellows. Their loud jabber is very amusing; one feels that it would be almost possible to get to understand their language. They are a very ill-tempered bird. We put two into a box with a partition between them; they broke through this and killed one another—the partition, I suppose, preventing them from meeting with the fate of the Kilkenny cats. Meantime many of their friends had assembled from the whole surrounding neighbourhood, and their persistent efforts, day and night, to liberate the prisoners were rather touching, but very noisy. I am not aware that the nest of the kea parrot has ever actually been seen. I must not omit this chance of expressing the great admiration which I felt for Mr. Fitz Gerald's Swiss guide, Zurbriggen, throughout this expedition. He is a man who seems, in every way, worthy of the high esteem felt for him by all those who have ever employed him. Altogether, I congratulate Mr. Fitz Gerald on the success of his expedition, and, as myself a witness of the hardships he had to endure and the obstacles he had to surmount, I think I may say that this success was very fairly earned.

The PRESIDENT: It only remains for us to thank Mr. Fitz Gerald, who has performed a great and important public service in discovering this, probably the only pass through the great snow range of New Zealand, and who has enhanced the interest of these surveys by the resolute way in which he has faced and overcome extraordinary difficulties. I am sure you will all pass a very cordial vote of thanks to Mr. Fitz Gerald for having told us so admirably the story of his expedition, and for having illustrated it with so many interesting views. I call on you to pass this vote of thanks unanimously, and to allow me to thank Mr. Fitz Gerald for his paper.

CRUISE OF THE "BALÆNA" AND THE "ACTIVE" IN THE ANTARCTIC SEAS, 1892-93.

I. THE "BALÆNA."

By WILLIAM S. BRUCE.

WITH the exception of a flying visit made in 1874 by the *Challenger*, the Antarctic Regions had up to 1892 been entirely neglected since Ross's expedition of 1843, and well-nigh forgotten. An accident of commerce then led to a slight revival of scientific interest. A fleet of four whalers set out in September, 1892, from Dundee to search the Antarctic seas for the bowhead (*Balæna mysticetus*), or some similar whale. The fleet consisted of the *Balæna*, in which I sailed as naturalist, the *Active*, the

Diana, and the *Polar Star*. Our vessels, after a voyage which was prolonged to thirty or forty days beyond the calculated time, and during which the chief fact of much interest was the complete failure of the north-east trade winds, met at the southern ice in Erebus and Terror gulf. There we found an earlier arrival, the Norwegian sealing vessel *Jason* (Captain Larsen), the ship in which Nansen set out from Iceland for his famous crossing of Greenland. The *Jason* was strictly on commerce bound, though the spirit of the great explorer who had sailed in her earlier had in some measure descended on Captain Larsen, for, without any special resources, he showed a zeal for extending our knowledge of these regions that would not have been unworthy of the leader of a purely scientific expedition. A scientific department had been attached to the Dundee whalers. With the consent of the owners and masters, the Royal Geographical Society spent over £150 in equipping these four vessels with instruments for geographical observation. The Meteorological Office provided a complete set of meteorological instruments. Mr. Leigh Smith, who has done so much to enlarge our knowledge of the Arctic regions, extended his exploring interest to the Antarctic by adding to the *Balæna's* equipment a handsome outfit of biological apparatus, a deep-sea thermometer, etc., for my use. Professor Haddon contributed two deep-sea thermometers, and Dr. H. R. Mill a pocket-aneroid and a spectroscope. The *Active*, the *Diana*, and the *Polar Star* were supplied by Professor D'Arcy Thompson with a zoological outfit, while he drew up a series of careful directions to guide us all in the collecting and preserving of natural history specimens. I take this opportunity of thanking these gentlemen and many others not named for their support. Dr. Mill especially was untiring in his endeavours to make the expedition a scientific success; for, besides the valuable personal contributions mentioned above, he drew up, on behalf of the R.G.S., a valuable set of instructions for the naturalists, and of suggestions for the captains who were now to sail for southern seas for the first time. I have to thank Professors James Geikie, D'Arcy Thompson, Dr. John Murray, and Mr. Robert Irvine for their valuable appendices to this paper. Mr. Andrew J. Herbertson has given me many valuable suggestions in compiling the tables; and Mr. William C. Spence's help has been invaluable to me in drawing up this report.

We sailed on September 6, 1892, and the *Balæna* first saw ice, in the afternoon of December 16, about 59° 40′ S. and 51° 17′ W. The same night about ten o'clock we sighted our second berg. From this point I give a brief journal of the voyage for the few days until we finally settled down to look for whales among the ice.

December 16.—Position at noon, 59° 24′ S., 51° 1′ W. (by observation). The weather was fine and bright in the earlier part of the day, becoming overcast and rainy in the afternoon and evening. The wind was westerly, backing a little in the afternoon, varying from a gentle

to a moderate breeze. The barometer fell steadily from 29·834 inches at 6 a.m. to 29·515 at 8 p.m. The sea was smooth to slight. All day we were surrounded by myriads of birds, mostly cape pigeons, among them being thousands of blue petrel and smaller numbers of mollyhawk. On the water surface, from quite near to the ship to far on the horizon, we could see thousands of the finner or blue whale, blowing the water into fountain-like spouts, and filling the air with their characteristic note of booming resonance.

December 17.—Position at noon, 61° 6′ S. and 52° 3′ W. (by account). The weather was foggy all day, with the temperature falling throughout the day from 33·7° to 29·8° Fahr. The wind was light and varying from the west. The barometer was fairly steady, rising slightly after 8 a.m. The sea was smooth. The same day I was called on deck to see, as I was told, some small seals. They were swimming with rounded backs just below water, and only the head above it. What the sailors took for seals were really penguins, with their silky, hairlike feathers looking like wet fur. The sailor refuses to recognize feathers in this close-fitting fleece, black on the back and white on the breast. We met with drift ice and a few bergs, both small and great. To-day we saw and shot our first seal, a sea-leopard (*Stenorhynchus leptonyx*), one of the largest kinds, as it drifted past us asleep. The lead was cast, with 100 fathoms no bottom.

December 18.—Position at noon, 61° 44′ S. and 52° 18′ W. (by account). Rainy and foggy weather, with a uniform temperature a little above freezing. A light wind in the morning rose in the evening to a moderate gale, accompanied by squalls; it veered round from E. by S. at 8 a.m. to W. at 4 p.m., and backed in the evening to W.S.W. The barometer fell slightly till noon, rising again towards the evening. We passed a great many large bergs and much broken ice. The bergs were mostly tabular, with a few other shapes. There were a few birds of the kinds already mentioned.

December 19.—Position at noon, 62° 12′ S. and 52° 13′ W. (by observation). The fog rose suddenly at 8 a.m., revealing a bright sun; the sky was cloudy, and became quite overcast by evening; the temperature remained practically uniform, about a degree above freezing. The wind backed from N.W. by N. to N.N.E., rising from a light breeze at 8 a.m. to a fresh gale at 8.30 p.m. The barometer fell considerably in the course of the day. The sea was slight, with a northerly swell. When the fog lifted we found ourselves surrounded by icebergs, the resounding murmur of which had been reaching us through it. One berg of 10 miles' length, by bearings, that we saw yesterday, we found now considerably broken up by the swell. To-day we saw the largest berg the *Balæna* met; it was 30 miles long. At noon we came on a great body of ice, which, according to the skipper, was the main pack. There was an icy sky towards the South Orkneys

to the north-east. Hitherto we had been pursuing a more or less southerly course, but now headed in an almost westerly direction.

December 20.—Position at noon, 62° 18′ S. and 53° 45′ W. (by account). Very foggy; with same temperature as yesterday. The wind was light all day, veering from N.W. by N. at 6.30 a.m. to W. by S. at noon, and backing to W. by N. by S p.m. The barometer rose from 28·805 at 6.30 a.m. to 28 951 at 8 p.m. The sea was smooth, with a heavy cross swell from N.W. by N. and N.E. by N., and at 4 p.m. very heavy from N.W. by W. Soundings were got in 161 fathoms, and the bottom temperature was 29·8° Fahr., the surface temperature being 30·3° Fahr. We met many bergs and much broken berg ice. During the day we saw cape pigeons and petrels, blue, stormy, and white. The last Ross found to indicate proximity to the main pack.

December 21.—Position at noon 62° 21′ S. and 54° 3′ W. (by account). The fog still continued thick, becoming clearer at 3 p.m., but soon coming down again as thick as ever. The temperature was a degree lower than the last two days, except at midday, when it rose to 34·2° Fahr. Moderate wind, backing from N.W. by N. at 9 a.m. to N.E. by E. at midnight. The barometer continued to rise until 8 p.m., standing then at 29·045, and then fell again. The sea was still smooth, with N.W. swell, which became slighter to midday; and in the afternoon a slight N.E. swell. The colour of the water after 8 p.m. was a dirty green. A number of soundings gave depths from 139 to 170 fathoms. We were still amongst bergs. Besides the birds of yesterday, we saw a sheathbill and some terns; there were many whales, none resembling the bow-head, and also some seals.

December 22.—Position at noon, 63° 2′ S. and 54° 31′ W. (by observation). The weather was foggy and overcast with fine snow: the temperature varied between 29·9° Fahr. and 31·9° Fahr. A light wind backed from N.E. by E. to S.S.W. from 2 a.m. to 10 p.m. It is notable that, in spite of this change of wind, the fog, as stated above, still continued. The barometer was unsteady in the morning, but during the afternoon it rose, till at midnight it stood at 29·097. The sea was still smooth, with a slight N.W. by N. swell, and the water of a dirty green colour. Soundings in the afternoon gave 235 fathoms, the bottom temperature being 28·6° Fahr., and surface 30·9° Fahr. Soundings at 8 p.m. gave 175 fathoms, with a bottom temperature of 29·5° Fahr.; at 50 fathoms, of 29·7° Fahr.; and at surface, 29·7° Fahr. Still the same birds and whales.

December 23.—Position at noon, 63° 24′ S. and 54° 11′ W. (by observation). The weather was at first hazy and overcast, and then became brighter, though cloudy; a slight snow-shower at 8 a.m.; the temperature remained as yesterday. The wind was light and variable, W. by S. to S.E. by S. The barometer rose to 29·264 at 10 p.m. The sea varied from slight to calm, and the water from being inky became a

dirty brown. This latter colour, like the snowy petrel, of which we saw some to-day, Ross had noted as an indication of proximity to the main pack. When to the south-east of Danger islands we passed great chains of bergs and great quantities of pack ice, having sighted Joinville Land and the islands in the early morning. We passed a good many seals, and for the first time saw the white seals (*Stenorhynchus carcinophaga*). We still had the birds before mentioned.

December 24.—Position at noon, 64° 13′ S. and 55° 52′ W. (by observation). This is the exact point which Ross reached on New Year's Day, 1843, and there is no record that any one did so before, or has done so since, till Christmas Eve, 1892. We fastened to a large floe, on the look-out for the whales reported by Ross. We were within 12 miles from Cape Seymour, and Mount Haddington was visible further to the west. The weather to-day was fine and bright, a cloudy sky being at times broken by brilliant sunshine; morning and evening there were slight snow-showers. The temperature varied from 29·3° Fahr. to 32°. Light wind, chiefly from S. by W., being more variable in the afternoon. The barometer rose all day to 29·482 inches at midnight. The sea was very smooth, and in the evening calm. To-day we first marked down a current, which was S.S.E. Soundings at 8 p.m. gave 194 fathoms, Ross having there registered 200. Bottom temperature, 28·6° Fahr.; at 100 fathoms, 29·2° Fahr.; at 50 fathoms, 29·3° Fahr.; and at surface, 32° Fahr. The water was olive-brown in colour, as well as the water-washed parts of the pack and the bergs. The bergs were large, numerous, and tabular. One weatherworn berg had masses of rock and soil on it, but, the harpooners thinking it dangerous, I was not allowed to secure any specimen of this rock and soil. We captured some seals, and, though we saw many whales and grampuses, we saw no whale resembling the bowhead. All the previously named birds were present, and we shot and secured for the first time the sheathbill and the emperor penguin. At midnight it was a perfect calm, as the *Active*, the *Diana*, and the *Balæna* lay fastened to the floe—the *Polar Star* not having yet joined us. I took several photographs of our surroundings at midnight, but no photography could give a hint of the light and colour of this Antarctic midnight. Never have I witnessed such excellent delicacy of colour. Though the sky was grey, the ice the whitest of the whites, and the sea in contrast blackness itself, yet rosy hues, purples, soft blues, translucent greens, and yellows shed their coloured mantle of light upon the whole; different indeed from the tropics, where colours are infinite and brilliant, yet often perhaps too crude.

December 25.—Position at noon, 64° 23′ S. and 56° 14′ W. (by observation). We remained fast all day to the floe, in fine weather with very slight showers of fine snow in the early morning. The temperature varied more than usual, ranging from 29·4° Fahr. to 35° Fahr.

There were light airs from E. to S. till early afternoon, and a calm after. The barometer went on rising, reaching 29·704 inches at 6 p.m. The calm sea was still of the brown colour. Soundings were obtained at 8 p.m. in mud at 200 fathoms, again confirming Ross. The bottom temperature was 28·9° Fahr.; at 120 fathoms, 28·8° Fahr.; at 60, 29·2° Fahr.; and at surface, 31·8° Fahr. There were remarkably few appearances of animal life.

This day ends the regular and accurate record of positions, till it was resumed on February 18 on our leaving the ice.* The whole ship's attention was given to the search for the expected whale, north, east, south, and west of Ross's 1843 position, varied with the catching of about 1000 seals. This went on to January 12, when hopes were finally given up of getting whales. So far as it goes, this search failed to confirm Ross's statement as to the existence of the black whale in these waters, though a contradiction of the statement would not, in my opinion, be justified till a search be made more extensive, both in space and in time. than was undertaken on this occasion. Whales there were, as already stated, but whales of the finner tribe, which require very different ships and tackle to those we were supplied with. Were vessels and tackle such as are used off the Norwegian coasts despatched to the Antarctic, I am confident that the blue whale fishery could be prosecuted with great success.

Day after day followed, till February 18, with the same tasks, namely, bringing seals on board and "making them off." I was usually out with one of the boats, but sometimes remained on board, and then often at the wheel. On these occasions meteorological observations suffered, but during gales, when all hands were usually on board, fairly copious notes were taken.

The scientific work of the expedition was not done in very favourable circumstances; commerce was the dominating note. A great deal more might have been done for the geology and the biology of these Antarctic Regions if some opportunities for landing had been afforded me. So early as December 26 I had the misfortune to lose the bucket for taking samples of surface water, and, as it was never replaced, observations for salinity were completely stopped after that date; and as for temperatures, they were only got under such imperfect conditions as lowering the thermometer over the ship's side when she was quite still.

The following notes contain observations between December 16, 1892, and February 18, 1893.

Land.—The *Balæna* was never within less than 6 miles of land. What we saw of it from that distance was entirely snow-clad, except on

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* The Dundee vessels cruised during the two months between 60° and 65° south and 51° and 57° west: that is to say, within an area measuring 300 by 180 miles

the face of precipitous slopes, where snow could not lie. These uncovered parts appeared quite black, and, so far as could be judged in the circumstances, were of igneous origin.

A few rocks secured from a piece of ice and from the stomachs of penguins bear this out, for Professor James Geikie informs me that a rough examination of them shows them to be mostly of igneous origin. The two largest specimens, he says, are olivine. The smaller ones will need a more careful examination, but among them he recognizes basalt, basalt lava, and possibly gabbro. Dr. Murray, however, finds evidence of continental rocks in some bottom samples I secured. I regret that I was unable to bring more rock specimens, several of the largest having been heaved overboard by some unknown member of the crew. I believe these latter were also olivine.

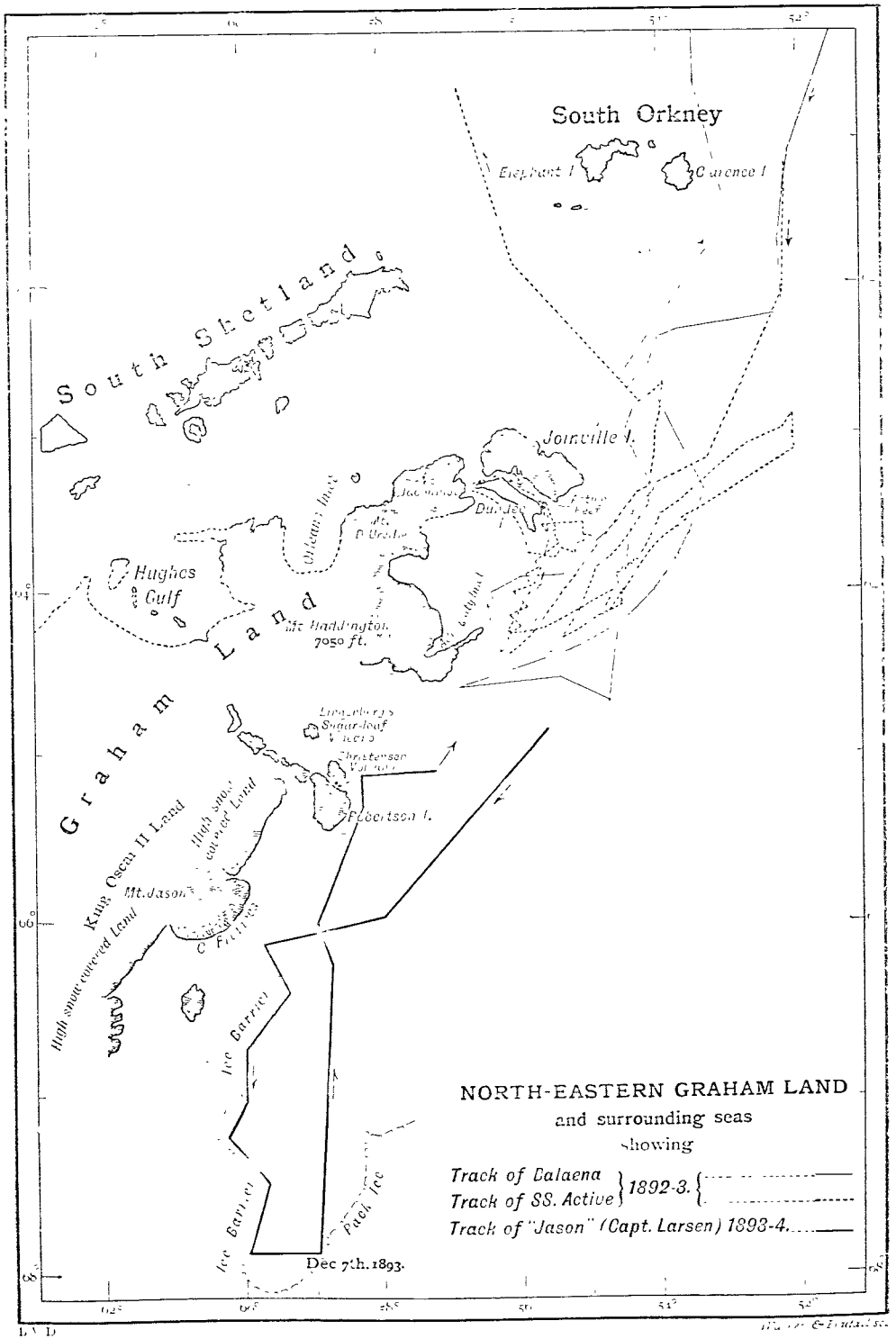
On several occasions I saw rocks and soil on the ice and on bergs, and once we passed a very stratified earthy piece of ice, but I was not allowed to procure specimens.

As to the geographical distribution of land, the *Balæna* made no important discoveries. The small islands in the northern portion of Erebus and Terror gulf were thought to be somewhat inaccurately charted, but no correction was made. On January 12 we were in *about* lat. 64° 35′ S., long. 56° 52′ W., and saw what appeared to be high mountainous land* and glaciers at a distance of 60 miles, stretching from a point about 64° 25′ S. and 59° 10′ W. to about 65° 30′ S. and 58° W. Captain Fairweather said definitely that this was land, and has marked it in his chart as such. I should rather be inclined to call it, in Ross's words, "an appearance of land," for, although it certainly looked like it, and I believe may have been the east coast of Graham's Land, yet one must remember how often Ross sailed over what he believed to be certain land, and how others have mapped out regions which never existed.

It is extremely regrettable that no effort has been made to approach this supposed land, and, if it really existed, to map it out accurately. This seemed to me quite possible, for by all appearances there was no very compact ice in that direction; certainly we could have got much nearer than we did. But back to the seals and blubber was the *mot d'ordre*.

Ross ('Antarctic Voyages,' ii. 324) calls the attention of future explorers to the belief of Captain Crozier and his officers, that they saw smoke issuing from a certain mountain: what mountain, however, Ross does not very clearly particularize. This phenomenon had not been observed by any one on the *Erebus*, but he thinks it may have accidentally escaped notice there. Captain Crozier's observations he attributes to wreaths of snow or mist whirling round the hilltops. I believe, from

* Captain Larsen (1893–4) confirmed and extended his own and our discovery in the following season by mapping out the eastern coast of Graham's Land to about 68° south.


South Orkney
Elephant I.
Clarence I.
South Shetland
Joinville I.
Hughes Gulf
Graham Land
Mt. Haddington 7050 ft.
Duke of York I.
Christensen Volcano
Foerstsen I.
Kaiser Oscar II Land
High snow-covered Land
Mt. Jason
C. Fairfax
Ice Barrier
Pack Ice
Dec 7th. 1893.
NORTH-EASTERN GRAHAM LAND
and surrounding seas
showing
Track of Lalaena
Track of SS. Active
1892-3.
Track of "Jason" (Capt. Larsen) 1893-4.

his description, that Ross refers to Mount Percy, the highest peak of Joinville island. If I am right in this belief, we had on February 6 an opportunity of confirming Ross. The *Balæna* was in 62° 58′ S. and 54° 45′ W. by bearings, less than 20 miles from shore. The low-lying land was enveloped in a bank of mist, but the peaks shone forth brilliantly in clear air and a cloudless sky, and neither from Mount Percy nor from any other hill, as far as the eye could reach, did we see any sign of an issue of smoke. Moreover, on Christmas Day we observed Captain Crozier's phenomenon, and found it to be accounted for by Ross's explanation. Mount Haddington had wreaths of clouds whirling over it, and appeared at times as if smoke were issuing from it; but the clouds swept away and left a smokeless peak in the clear air.

Ice.—The whole of the district we traversed south of the latitude of the South Shetland islands is strewn with bergs, and south of 62° S. they become very numerous. There was no day in which there was not some record of bergs being seen, but in some districts we found the sea much more thickly studded with them than in others. We met with the greatest number of bergs to the south-east of Danger islands, where I have counted from the deck at one time as many as sixty-five of great size, to say nothing of smaller ones. We met with very many about 60 to 100 miles north-east of Joinville island at the end of December, and also at the beginning of January, in about 64° 30′ S. and 54° or 55° W. On January 11, in 64° 32′ S. and 55° 25′ W., we came across a row of ten bergs of great length running east and west along the pack edge. On February 10, when in company with *Diana* and *Jason*, we saw many great bergs, one 4 miles long, another 1 mile long. The longest we met with was fully 30 miles in length, and one was 10 miles long by bearings. Many others measured 1 to 4 miles in length. The highest berg recorded by us was about 250 feet above water, but many were not over 70 or 80 feet high; I should say the height of most of the bergs was about 150 feet. I have recorded a berg twice the height of the *Jason* lying a considerable distance S.S.W. of Paulet island. On January 1, off Danger islets, there were bergs half as high again as the *Diana* and the *Active*, and in the same place a berg three-fourths the height of the *Diana*. Nearly all the bergs are tabular or weather-worn varieties of the tabular. On December 18 we came across several more varied in shape than usual; one was beautifully conical, and one had very well-marked stratification. On December 20 we saw a castellated berg, looking like part of some strange fortification; one was hewn into beautiful Doric pillars; others were in the form of grand arches; others had great caves hollowed out of them, which in some cases were connected with vertical holes piercing their upper surface. Through these holes, when a heavy swell beat up the caverns, columns of water and spray were ejected, often to a great height. Other bergs overhung their water-worn bases. Strange cracks and

fissures abounded. The whole face of a long berg sometimes exhibited a row of perpendicular fissures, the walls of which were bowed out. On several occasions, notably on December 18 and 20, I saw bergs which were fringed with pale brown along their upper edge, and sometimes with pale brown streaks, like a vein, apparently sandwiched in their main mass. This, I believe, has not been before noted. Ross mentions the base of bergs and pack-ice being coloured brown by organisms that exist very abundantly in the water, which our observations also confirmed. But this new observation refers to the top of the bergs, at a height of perhaps 150 to 200 feet above sea-level; and that, too, in bergs that had never been overturned. The tops being inaccessible, we got no specimen.

Apart from these very occasional streakings, the bergs are white. There is a complete absence of tints, except for the infinitely varied play of the light. In the fissures one gets the most magnificent blue, a blue which Mr. Burn Murdoch, the artist of our *Balæna* company, thinks resembles cobalt. But it cannot be described, and no palette has resources to paint it. Those who wish to appreciate its purity and intensity must see it for themselves. Similarly, there are brilliant splashes of emerald green, with an infinite number of other shades. Many of the overturned pieces of some broken-up berg look like huge masses of sulphate of iron that have undergone some oxidation. Although on many dark nights we were surrounded by bergs, in no case did I observe any such phenomenon as a luminous glow on them, as Dr. John Murray has noted.* But I have, I believe, observed a luminous glow from the pack-ice.

The pack-ice of these regions was said on the *Balæna* not to be heavier than in the north, if it were as heavy. It is also similar in nature. Therefore I need not describe it here. The conglomeration of pack and broken pieces of bergs is also similar to that of the north. One must note, however, how frequently it is coloured brown by the diatoms, *Corethron criophyllum* and others, which swarm in the water near the main pack.

We first met the dense pack-ice on December 19, in lat. 62° 20′ S., 52° 20′ W., the edge of which lay in a more or less easterly and westerly direction, and the sky seemed, too, to indicate ice towards the South Orkneys; but, by steering a more westerly course than we had been doing, we avoided it, as it appeared to trend in a southerly direction in about 53° 20′ W. On December 24, in 64° 13′ S. and 55° 51′ W., we fastened to the edge of a great floe, the end of which could be seen only at the masthead. On January 11 we ran east and west along the pack edge, which lay in about 64° 37′ S., our position at noon being 64° 33′ S. and 55° 25′ W.; but on January 12 we saw fairly open water

* The *Scottish Geographical Magazine*, vol. ii. p. 534.

to the south-west. The pack edge was seen, besides on the above dates, on the 5th, 7th, 19th, 20th, and 21st of January; but I cannot define the ship's position quite satisfactorily for these last-named dates, and I am therefore unable to say how and where the pack edge was, except on December 19 and January 11. The *Balæna's* work lay almost entirely between about latitudes 64° 30′ S. and 62° 30′ S., and longitudes 53° W. and 56° W. We never entered the main pack, except on one occasion at its extreme edge. In this region we only met with scattered pack-ice or with streams of pack-ice, which were sometimes very heavy. In February there was a considerable amount of pack-ice in Erebus and Terror gulf.

Red snow was reported to me on one occasion; but I rather suspect, from the description I had given me, that the colour was due to the blood of a slaughtered seal, which had soaked through the snow.

Sea.—The colour of the sea in those parts varies very much. Now it is blue and clear, now olive-brown and opaque; and between these two colours there is a series of shades from greenish blue, dark green, and olive green, and of transparency from clearness to opaqueness. The browner water seems to be in the neighbourhood of a great body of ice; we noted it at Christmas-time, coming into it first on December 23, and emerging from it on December 27, both north and south of Ross's 1843 position; and again we met it on the 10th, 11th, and 12th of January, in a second attempt to get south-west. For the rest of the time we found the water mostly blue, or very nearly so. The olive-brown colour is due to the *Corethron* diatom, which swarms, as we have said, in great quantities in these waters, and colours the pack-ice. It abounds on every shelf below the surface of the water, and in the holes of the honeycombed ice. The bases of bergs are coloured by it. The bluest water we found most profitable to hunt for seals in. After December 26, for reasons already stated, salinities were beyond my reach; but I was still able to take advantage of a few occasions of ascertaining deep-sea temperatures. The table of temperatures must be read with regard to these conditions. The deep-sea thermometers were left down for about two or three minutes before they were inverted; in no case were they left down for less than two minutes, and I should have preferred that the instrument should have been left down longer. It is, perhaps, of interest to remark that the reversing frame and Negretti and Zambra's thermometer had never before been used in this part of the globe, and it is a great pity I had no opportunities to use it oftener. The results, although very few, nevertheless are interesting, since they tend to indicate the intermediate cold layer and the correct bottom temperatures, which the experiments made by Sir James Ross and the *Challenger* failed to show. They are also similar to readings at similar depths of the Arctic seas.

On December 26, at 1.30 a.m., there was a dead calm; the dry-bulb fell to 24·6° Fahr., and a very thin layer of ice formed on the surface of the water. The temperature of the water was 31·1°, and

the specific gravity 1·0269 for that temperature by the salinometer. Again on January 7 there was a dead calm, and the surface of the water froze, the dry-bulb standing at 31·3°. This time I had no means of taking the temperature and salinity of the water. On January 17 I lowered the thermometer and kept it in four or five minutes in a long cylindrical hole about 6 inches in diameter in a piece of honeycombed pack-ice about 1 foot below the surface; the piece of ice was slowly passing across the stern of the vessel. I found the temperature to be 31·2° Fahr. The thermometer had the usual small cistern, which contains a considerable amount of water surrounding the bulb, and in this, as in other cases, as little time as possible was lost in drawing up and reading the instrument. On February 17, when the dry-bulb registered a temperature of 20·8° Fahr., the lowest record on the *Balæna*, there was no sign of ice forming on the water, but the water was far from smooth; a considerable amount of ice, however, was formed on the bows and other parts of the vessel exposed to spray.

South of Joinville Land we never experienced much swell, even during and after the hardest gale; it was interesting to note how a comparatively narrow stream of ice always broke the swell.

Not much attention was paid to currents. In the neighbourhood of Danger islets they were very strong; at times it was difficult for the vessel to make headway against them. These, I should say, were most likely tidal. In the neighbourhood of bergs they were also impetuous. I was in one of two boats one day that pulled for about four hours in the neighbourhood of a berg, and so strong was the current that we were only just able to hold our own against it. Near bergs the drift-ice moves very fast, now onward, now swaying round, caught in a whirlpool, and boat-steerers have to keep a sharp look-out to prevent being nipped.

Here follow the few observations made on currents:—

December 24.—64° 13′ S. and 56° 14′ W. Current S.E. by S.

January 1.—S.E. of Danger islands. Current W., 2 or 3 knots per hour.

January 29.—S.E. of Danger islands. Current strong.

February 2.—3 miles E. of Danger islands. Current S.W., slight.

On several occasions I threw out floats.*

Weather.—The meteorological observations of the expedition are more complete than any other set of observations, and for general (though perhaps more for local) conditions we have some interesting notes.

Periods of calms and gale alternate in this part of the world. On Christmas Eve and Christmas Day there was a perfect calm; the sky, except at the horizon, had a dense canopy of cumulus rolls, which rested on the summits of the western hills, and when the sun was just below the horizon, the soft greys and blues of the clouds and the

* Up to the end of 1895 none of these floats had been recovered.

spotless whiteness of the ice, as it floated in the black and glassy sea, were tinted with the most delicate of colours—rich purples and rosy hues, blues, and greens passing into translucent yellows. This was a very typical calm day, but there were also calm days with cloudless skies and brilliant sunshine. Should a gale blow from a southerly direction, it was usually accompanied by snow, and if from a northerly direction, by wet fog, as shown below :—

FEBRUARY 8, 1893.

Time.	Wind Force 1–12.	Clouds, 0–10	Weather.	Dry-bulb
1	N.W. 3	—	thick wet fog	32·3
8	N.N.E. 4 to 5 ...	10	overcast; thick very wet fog, and raw	32·8
10	N.N.E.	10	overcast; foggy, raw, raining	31·9
12	N. by W. 2	10	overcast; thick fog; very wet sky	33·4
16	S.W. 6 to 7	10	overcast; misty round horizon	30·1
20	S.S.W. 10	10	overcast; snow showers since 6 p.m.	29·6
22	S.S.W. 10	10	overcast; snowing; coarse dirty night	29·2

On January 29, 30, 31 and February 1 we had a hard gale. It blew chiefly from the S., but backed and veered between S.S.W. and S. by E. At times on the 29th and 30th I have recorded wind of a force up to 10. On the 29th I have noted that this was pronounced by all to be the heaviest of all since we made the ice; on the 30th the skipper told us that had we been in the open ocean, with our vessel in good trim, she would scarcely have borne close-reefed topsails. From 10 p.m. on the 29th till 8 a.m. on the 30th we steamed full speed * against the wind, and only made about 1 mile headway. Snow was falling almost continuously, being very fine and slight. The thermometer fell from 31·7° Fahr. to 27·7° Fahr. Again on February 10 I have recorded a brief N.W. and N.N.W. gale, after which there were some hours of calm. The wind by 8 a.m. on February 12 had veered to S., force 1, and, remaining S., increased to force 8 by 11 a.m., rising to a recorded 11 to 12 at noon. At 4.30 a.m. on the 13th it had not abated in the least; from 8 a.m. to 3 p.m. force 8 is recorded, and in the evening there was only a strong breeze. In this instance I must have recorded too great a force according to some authorities, since I am here to tell the tale; but our captain described it as the hardest gale that ever blew in the Arctic or the Antarctic, and so hard that we could not have borne close-reefed topsails in the open. For part of the time thick fog prevailed, and fine snow was driven before the wind. The thermometer fell from 32·4° Fahr. to 25·2° Fahr. The barometer was lowest at 10 a.m. on the 12th, standing at 28·978 inches, and by 1 a.m. on the 13th had only risen to 29·057.

* Under most favourable conditions, calm sea and no wind, the vessel can steam 8 knots.

Observations were made every two hours as far as was possible, and have been grouped in twelve columns for each day. The mean of these has been calculated for every month, and again from these twelve means the mean temperature of the month has been obtained. In no case does the mean monthly temperature exceed that of the freezing-point of water. For the last two weeks of December it was 31·1° Fahr., which was also the mean temperature of January, while that of the first eighteen days of February was 29·7° Fahr. In the region traversed from lat. 61° S. to 64° 40′ S., and from long. 53° W. to 57° W., which may roughly be compared to that of the Færoës in the northern hemisphere, the mean air-temperature in the month of maximum temperature is half a degree below the freezing-point, instead of about 23 degrees above it. It may be assumed that January is the warmest month, since the observations made in December, while giving the same mean temperature, were obtained only in the latter, and presumably the warmer, fortnight of the month. Except for the rise at 6 a.m. in December, which is the mean of only two readings, and is therefore not considered, the two hourly mean temperatures cross the line of the melting of ice only at 4 and 8 p.m. in December, and at 2 p.m. in January, the mean maximum at 2 p.m. in February coming within two-tenths of it.

The warmest twelve hours of the day (8 a.m. to 6 p.m.) averaged 31·5° in December, 31·4° in January, and 30·5° in February; while the night temperatures (8 p.m. to 6 a.m.) were 1·1° lower in January, and 2·9° lower in February (the night means cannot be calculated satisfactorily for December).

The following table shows the maximum and minimum readings in each month and for the whole period:—

	Maximum.	Minimum.	Range.
1892.			
December 16–31 ...	37·1°, noon on 16th	24·6°, 1·30 a.m. on 6th	12·5°
1893.			
January 1–31 ...	37·3°, 2 p.m. on 15th	27·7°, 8 p.m. and midnight on 30th	9·6°
February 1–18 ...	36·2°, 4 p.m. on 7th	20·8°, noon on 17th	15·4°

Hence the extreme temperatures recorded were—maximum 37·3° and minimum 20·8°, giving a range of 16·5° Fahr.

As with temperature observations, pressure observations were made every two hours, as far as was possible, and have been grouped in twelve columns for each day. The mean of these has been calculated for every month, and the whole period mean has been obtained. The mean pressure for the last two weeks of December was 29·357 inches; for January, 29·273 inches; and for first eighteen days of February, 29·169 inches. There is thus a falling off in pressure from December

to February, the mean for the whole period, December 16 to February 18, being 29·263 inches, or about half an inch lower than for the corresponding season in the Fœröe islands. All the means attain a maximum at 10 a.m. and 6 p.m., and all, except those for February, at midnight also. There seems to be a minimum period during the early morning hours. On the whole the pressure appears to be greater in the afternoon than in the forenoon; but the forenoon data are insufficient for obtaining reliable results.

The following table shows the maximum and minimum readings in each month and for the whole period:—

	Maximum.	Minimum	Range.
1892.			
December 16–31 ...	29·834, 6 a.m. on 16th	28·801, 8 a.m. on 20th	1·033 in.
1893.			
January 1–31	29·753, 4 p.m. on 2nd	28·745, 10 p.m. on 20th	1·008 in.
February 1–18	29·750, 4 p.m. on 6th	28·850	0·896 in.

Hence the extreme pressures recorded were—maximum 29·834 inches, and minimum 28·745 inches, giving a range of 1·089 inch.

Biology.—Prof. D'Arcy Thompson has treated biology at sufficient length for so general an account as this, and with much greater skill than I should. It may be mentioned, however, that we saw no whale in the least resembling the Greenland or bowhead whale (*Balæna mysticetus*), but many finners, hunchbacks, bottlenoses, and grampuses. Also four species of seals, all of them true seals, viz. the sea-leopard (*Stenorhynchus leptonyx*): Weddell's false sea-leopard (*S. Weddellii*); the crab-eater, or white Antarctic seal (*S. carcinophaga*); Ross's large-eyed seal (*S. Rossii*).*

Between the Falkland islands and the ice, and in the ice, I saw several white ropy-looking coils in the water, about a foot or so in length, and about an inch thick. I succeeded in securing one, but this, unfortunately, was heaved overboard before I could preserve it. This, a compound ascidian, was seen by Sir Joseph Hooker, in 1843, and later by the *Challenger* in 1873, but is now for the first time fully described.

All these observations were made, and these specimens procured, between December 16, 1892, and February 13, 1893. On the latter date we had glutted our ship with seals, and turned her head homewards. The following afternoon we passed Clarence island, the most easterly of the Shetland group, its three bold ridges looming through mist and scud. The land was wild and majestic, towering over the

* "Notes on Seals and Whales seen during a Voyage to the Antarctic" (Brit. Ass., Nottingham, 1893), by W. S. Bruce. Also "Animal Life seen on a Voyage to the Antarctic," *Proc. Royal Phys. Soc.*, vol. xii. pt. 2, xxvi. pp. 350–354.

adjacent icebergs. Like other land we had seen, it was entirely snow-clad, except on the most precipitous slopes, which were short and abrupt to the south, but long and easy to the north. On February 20, at 9 a.m., we passed our last berg in about 60° 27′ S. and 53° 40′ W., or about 40 miles north of Clarence island. Port Stanley was reached on the morning of February 28; Portland on May 24; and finally, on May 30, we came to rest at Dundee.

(*To be continued.*)

APPENDIX I.

Preliminary report on rock specimens obtained by W. S. Bruce from floating ice and from the stomach of penguins, by Professor James Geikie, LL.D., F.R.S.:—

"The large specimens of the dark rock are all basalt, and contain a good deal of olivine. There is nothing peculiar about them, for they exactly resemble many of the basalts obtained in this and other European lands.

"The small fragments obtained from the stomachs of penguins show little variety. So far as I can judge, without microscopic examination, they consist mostly of basalt. A few, however, seem to be trachyte. Most of the specimens appear to be water-worn more or less, and exactly resemble the small subangular and partially rounded *débris* which, along with larger fragments, one finds upon the coasts of a region composed of igneous rocks. I could find no trace of sedimentary or schistose rocks amongst the samples."

APPENDIX II.

Preliminary report on samples of marine deposits obtained by W. S. Bruce off the eastern extremity of Joinville island, by John Murray, LL.D., PH.D., etc., and Robert Irvine, F.C.S., etc.:—

"The samples of marine deposits from the eastern side of Joinville island come from depths of 130 to 235 fathoms. Those from the lesser depths consist of fragments of polyzoa and basaltic gravel. Some samples consist of basaltic and quartz sand. The samples from the greater depths consist of blue muds made up of many particles of quartz, volcanic rocks, feldspars, hornblende, augite, tourmaline, together with a few globigerina and other foraminifera, many diatoms and sponge spicules, and amorphous clayey matter. The mineral particles indicate that the adjoining land contains true continental rocks."

APPENDIX III.

Preliminary report on samples of sea-water obtained by W. S. Bruce between latitudes 56° S. and 63° S., and between longitudes 54° W. and 56° W., by John Murray, LL.D., PH.D., etc., and Robert Irvine, F.C.S., etc.:—

ANALYSIS OF ANTARCTIC WATERS.

Position.		$_0S_0$.	$_{17.5}S_{17.5}$.	$_4S_{15.56}$ Calculated from $_0S_0$.	χ. (Chlorine.)	CO_2 Milligrams per *Kilo*	D $\frac{_0S_0-1000.}{\chi}$	D_A $\frac{_0S_0-1000.}{CO_2}$
62° 31′ S. 54° x′ W.	surface	1027·37	1025·93	1025·10	18·777	49·95*	1·4576	0·5480
58° 25′ S. 55° 35′ W.	surface	1027·32	1025·88	1025·06	18·746	48·94†	1·4575	0·5582

APPENDIX IV.

Preliminary report on biological collections brought home by the naturalists of the Antarctic Expedition, by Professor D'Arcy Thompson :—

"The collections brought home by Mr. Bruce, of the s.s. *Balæna*, and the other members of the recent expedition to the Antarctic were not large, but almost everything that they contained was interesting. Owing to the circumstances that my laboratory and museum (in which most of the specimens have been deposited) are at present being rebuilt, I can only give, in the mean time, the merest outline of the principal contents. The collection of birds was a very good one, but it is a matter of great regret that the bulk of it was retained by the captain of the *Balæna*, and has been dispersed owing to Captain Fairweather's too modest estimate of its interest and value. Among the specimens thus dispersed was a small gull with coral bill and dove-coloured neck and throat, which I only saw for a few moments, and which appeared quite new to me.

"Three splendid skins of emperor penguins were secured, all very large ; in one case the bird had weighed 74 lbs. A whole skeleton and a portion of a second were prepared by Mr. Bruce and presented to our museum. Skins, and in most cases skulls, were also obtained of the black-throated penguin, *P. adeliæ* : of the so-called *P. Herculis*, doubtless the same species in immature plumage; and of *P. taniatus*, the ringed penguin. The white-headed penguin, *P. papua*, was also observed in quantity, and a skull and egg are in the collection. This very valuable series of penguins has been fully described by Dr. Donald of the s.s. *Active*, in a paper about to be published by the Royal Society of Edinburgh.

"The other birds do not call for much remark, except perhaps one specimen of the Antarctic skua, in which the golden tinge on the brown feathers of the breast is very conspicuous.

"A small dolphin, not yet identified, but probably a young specimen of a known species, was brought home from the Falklands. Among the invertebrates, by far the most interesting specimen is one of the great compound Ascidian, apparently identical with that mentioned by Professor Herdman in the 'Challenger Report.' This form has not hitherto been named on account of the bad condition of the *Challenger* specimen, and another in the British Museum; but the present specimen is fairly well preserved, and promises to be of great interest. A considerable number of shizopod crustaceæ of the genus *Euphausia* were preserved. They are all large species. One of them appears to be identical with *E. Murrayi* (Sars), of which only two specimens are recorded in the 'Challenger Report.' The others we have not yet identified, and some at least are almost certainly new.

* = 51·2 per litre. † = 50·17 per litre.

"The tow-nettings from the Antarctic consist almost entirely of the characteristic diatomaceous genus *Corethron*, which is present in a very large number of forms.

"On the homeward voyage, Mr. Bruce took a number of tow-nettings in the south temperate and torrid zones of the Atlantic. In these the copepods are well preserved and very numerous; but we have not examined them, nor shall we do so until the report is published of the *Buccaneer* collections, with which these will doubtless closely agree.

"On the whole the zoological collections of the expedition are disappointingly small. But it must be remembered that in the hurry and work of a sealing and whaling voyage no attention can be spared to the naturalist's need, unless, indeed, special arrangements have been made, and the cost of the voyage in part defrayed with that end in view. But, on the other hand, of the collections brought home, the objects gathered in the extreme south are one and all either new or rare, and whet our appetite for further scientific exploration of the Antarctic seas."

TABLE OF SOUNDINGS.

(W. S. Bruce.)

Date.	Civil hour.	Depth in fathoms.
1892, December 17 ...	Noon	100, no bottom.
No. 3, „ 20 ...	19.30	161
„ 21 ...	9.0	142
No. 6. „ 21 ...	10.0	140
„ 21 ...	11.30	139, white sand.
„ 21 ...	12.0	139, white sand.
No. 7. „ 21 ...	20.0	170
No. 8. „ 21 ...	22.0	147
No. 9. „ 22 ...	2.0	180
No. 13. „ 22 ...	6.0	130
No. 17. „ 22 ...	10.0	235
No. 18. „ 22 ...	14.0	235
No. 19A. „ 22 ...	20.0	175
„ 23 ...	9.30	80, rock.
„ 23 ...	14.0	126
„ 23 ...	24.0	180
„ 24 ...	20.0	194
„ 25 ...	20.0	200
„ 28 ...	18.30	121
1893, January 20 ...	10.0	305, no bottom.
„ 22 ...	20.0	310, no bottom.
„ 23 ...	18.0	310, no bottom.
February 1 ...	14.0	130, sand and small stones.
„ 1 ...	18.0	130, sand and small stones.
„ 1 ...	22.0	138
„ 1 ...	24.0	132
„ 2 ...	between 12.0 and 8.0	140
„ ...	19.20	160, rock.
„ 5 ...	10.0	200
„ 5 ...	14.0	140, green mud.
„ 5 ...	19.30	199, stones and mud.

The numbers are those of samples from the lead which have been preserved.

TABLE OF SURFACE AND DEEP SEA TEMPERATURES.

(W. S. Bruce.)

Depth in fathoms.	Dec. 20, at 19.30	December 21, at 9	10	12	21	22	December 22, at 10	14	20	Dec. 24, at 20	Dec. 25, at 20	Dec. 28, at 18.30.	Jan 20, at 10.	Jan 23, at 18.	Feb. 1, at 18.	Feb. 2, at 19.20.	February 5, at 19	14	19.30
Surface ...	29·9 at 20 hrs.	30·1	—	—	30·7	31·0	31·1	30·9	29·7	31·3	31·6	..	30·8	30·7	29·9	—	29·9	30·1	30·1
50	—	—	—	—	—	—	—	—	29·7	29·3	—	—	—	28·8	—	—	30·1	—	30·6
60	—	—	—	—	—	—	—	—	—	—	29·2	—	—	—	—	—	—	—	—
100	—	—	—	—	—	—	—	—	—	29·2	—	—	—	29·6	—	—	—	29·8	—
108			—	—	—	—	—		—	—	—	—	—	—	—	—	—	—	30·0
120	—		—	—	—	—			—	—	28·8	28·8	—	—	—	—	—	—	—
129	—	—	—		—	—	—	—	—		—	—	—	—	30.8	—	—	—	—
138	—	—	—	29·1		—	—	—	—	—			—	—	—	—	—	—	—
139	—	—	29·5	—	—	—	—	—		—	—	—	—	—	—	—	—	29·8	—
141	—	29·5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
146	—	—	—	—	—	28·8	—	—	—	—	—	—	—	—	—	—	—	—	—
159	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	30·2	—	—	—
160	29·8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
169	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
171	—	—	—	—	—	—	—	—	29·5	—	—	—	—	—	—	—	—	—	—
193		—		—	—	—	—	—	—	28·6	—	—	—	—	—	—	—	—	—
199	—	—	—	—	—	—	—	—	—	—	28·9	—	—	—	—	—	29.3	—	—
231	—	—	—	—	—	—	28·7	28·6	—	—	—	—	—	—	—	—	—	—	—
301	—	—	—	—	—	—	—	—	—	—	—	—	32 1	—	—	—	—	—	—
309	—	—	—	—	—	—	—	—	—	—	—	—	—	32·0	—	—	—	—	—
Bottom in fathoms	161	142	110	139	170	147	235	235	175	191	200	121	no bottom at 305	no bottom at 310	130	160	290	140	109
Positions	62° 18′ 53° 45′	—	—	62° 21′ S. 54° 3′ W. noon.	—	—	—	63° 2′ 54° 31′ noon	—	61° 13′ 56° 14′ noon.	61° 25′ 56° 14′ noon.	61° 2′ 56° 23′ noon	64° 40′ 55° 0 10 hrs.	66° 55′ 54° 33′ 18 hrs	53° 16′ 63° 28′ noon	52° 58′ 63° 22′ 19.20 hrs	— — —	62° 33′ 54° 18′ noon	— — —

Until December 25 positions are correct; after that date there exists some doubt, but the positions may be regarded as very nearly correct; they are the best results obtainable. The deep-sea thermometer has not been corrected for error. It was supplied by A. Frazer, Edinburgh. The surface thermometer was B.T., No. 3211, and has been corrected.

Date.	Wind.		Barometer.	Thermo.		Weather.	Sea surface	
	Direction.	Force.	Barometer.	Att. ther.	Dry.	Wet.		Temp.	Sp. gr.
1892.									
December 17	W.	3 3	29·445	58·67	35·55	35·22	F.	34 78	29·0
18	N.E. / W.	2 5 / 4·3	29·261	54·27	33·52	33 23	Fr	32 30	29 5
19	N.W. / N.N.E.	1·9 / 4 6	29 278	48·97	34·00	33 72	O F.	32 17	27·5
20	N.N E.	2·6	28·962	49·28	35·95	33 63	F.	31 53	26 5
21	N.W.N.	1·7	29·104	45 83	32·97	32·33	F.	31·55	27·5
22	E.	1·5	29·091	48 67	33·28	31 67	F.	30 95	28·0
23	S.	2·2	29·264	51·47	33·42	32·45	O G	32·25	27·5
24	S.	2·0	29·470	49·48	32·84	31·80	C B.S.	32·74	27·0
25	S.	6·3	29·689	49 39	32 53	31 45	C B.	32 52	28 0
26	E.	2 3	29·763	51 05	33·15	29 48	O.	32 18	27 0
27	E.	5·0	29·595	47 75	31·15	31·20	O G	31·52	27·5
28	E	4·6	29 509	41·13	31·27	31·27	O G.M.	31·90	27·0
29	N.N.E	3 6	29 499	48·15	31 32	31 32	O.G.	31·76	27 0
30	E.	2·0	29·543	49 35	30 14	30·25	O.	31·07	27 0
31	S.E.	1·6	29·584	47·08	31 05	31·10	C B.	31·28	27·0
1893.									
January 1	E. & N.	1 0	29·624	45·08	31·70	30 32	C.	31·53	27 5
2	N.	1·4	29·633	48·60	31·55	34 55	B.	32·33	27 5
3	N.E.	4·1	29·497	47·70	33·67	32 52	O S C.B.	31·87	27 5
4	N.E.	3·0	29·409	46·72	32·80	31 03	O M Q., 5 S.	31·02	27·0
5	Calm	0 0	29·512	48·70	34·76	34 09	O.	32 20	27·0
6	E. & N E.	3·2	29·416	49·95	35·48	34 15	O.S.Q.	32·10	27·0
7	W.	0·8	29·481	50·40	35 00	33·64	O.S.	31 92	27 5
8	W.	1·7	29 424	51·67	34·73	33 88	O M.F.	32·32	27 5
9	N E. / N.W.	1 5 / 0·2	29·270	50·90	35·93	34 52	O.F.	33·08	27 0
10	S.	5·2	29·150	43·50	32·20	31·62	O M., 10 S.	31·87	27 5
11	Calm	1·0	29·330	50 08	36·10	34 82	C B.V.	32·34	27 5
12	N. / S.E.	3·4 / 1·7	29·241	48·82	33 28	32 55	O.S.	32·03	28·0
13	E. / Calm	1 4 / 0·0	29·379	49·54	33·02	32 12	O F.	32·02	27·5
14	N.E.	1·2	29 604	47 27	35·05	33 28	C.B.	32·30	27·5
15	N.	2 1	29·685	45·77	34 57	33 40	B., F.	32·03	27 5
16	N.N.E.	2·9	29 655	44·27	31·72	31 15	F.	31·50	27·5
17	N.	3·8	29·652	46 03	33 50	32 75	O M.G	32·23	27 5
18	N.W.N.	3·6	29·452	46 63	34 15	33·75	F., O M G.	32 05	27 0
19	W.	4 2	29 051	44·83	33·03	32·17	O.G M., F., IV., 6 S	32 05	26·5
20	W.	2·9	28·934	46·20	34 22	33·50	O.F.G.	32·35	26·5
21	W. / S.	1·3 / 2·0	28 897	47·52	34 12	33·38	F., C B.	32·35	27·0
22	W.	1·0	29 119	48·38	34·70	33·44	O.M , C B	32 74	27·0
23	Calm / E.	0·0 / 3·0	29 122	49·28	32·15	31·27	C.V , O 3 S.	31·42	27·0
24	E. & S.	3·8	28·741	48·88	31·87	31·35	O M.S.	31·72	27 5
25	S.	3·3	29·105	48·30	32 02	31·63	O.M.D	32·13	27·5
26	S.S.E.	1·5	29·415	49·92	32·77	31·85	O , C.B.	32·40	27 5
27	E.	0·7	29 563	45·00	32 78	30·93	C.B.	32·05	27·5
28	S. & E.	2·8	29·474	43·55	30·92	29·75	C.B.	31·62	28 0
29	S.	6·7	29 161	41·67	29 95	29·74	C.B.	31·28	28·0
30	S.	7·2	28·624	40·26	29 38	29·09	O , C	30·80	27 5
31	S.	6·6	29·089	48·52	30·32	30 32	O.M., 11 S.	31·58	27·5
February 1	S.	6·3	29·014	43 77	30·65	31·57	O.M , 10 S.	32·05	27 5
2	S.E.	2·3	29·165	47·80	31 25	31 05	O.	31·58	27 5
3	S.E.	2·5	29·128	49 14	31 46	30 75	O.V., O 3 S.	31·50	27·5
4	S.E.	4·5	29 010	31·47	31 62	31·43	O.F., 16 S.	31·12	27·6
5	S.S.E.	5·2	29·299	45·40	31·28	31·05	O M , 12 S.	31·27	27·2
6	S. / W.	2·6 / 2·2	29 723	44·13	33·22	31·85	C.B.V.	31·53	27·0
7	W.N.W.	2·8	29·399	46·23	35 05	34 23	O.F., 4 S., C.B V.	31 73	27·3
8	N. / S.W.	2·1 / 7·0	29·099	46·80	30·48	31·55	O.F , 3 E D., 4 S.	30·95	27 6
9	S.S.W.	4·4	29 520	44·50	31·18	30·55	O.M.	31·55	27 2
10	N.N.W.	3·4	29·433	45·57	33 73	33 49	O.M.	31·43	26·5
11	N.W.	2·7	29 254	47 72	34 62	33 93	B.C.I.	31·13	27·0
12	S.S.E.	5·4	29·141	43·35	29·24	28·90	O F., 11 S.	30·76	27 0
13	S.	7·0	29·246	42·73	26·13	25·75	O Q.S.	31·22	27 4
14	S.S.E. / N.W.	1·8 / 3·3	29·131	45·30	28 75	28·25	C.B., O M.	31·92	27·0
15	E.	2·7	29 097	43·83	29·43	28·58	O M., 10 S.	31·13	27 2
16	N.E. / S E.	3·4 / 6·0	29·008	52·26	30·60	31·04	O M , 5 S., LV , 4 D.	30·94	27·5
17	S.S.E.	4·6	29·152	42 92	24·12	24 17	C.	30·00	27 5
18	N E. / N.N.W.	1·4 / 3·4	29 330	46 73	31 94	31·58	O.M.G.F.	30·68	27·4
19	N.N.W	3·9	29 181	49·63	35·33	35 05	O.F , 11 D	31·77	27·5
20	W.N.W.	2 7	29·101	45·27	33·28	32·77	F , 4 D., C.B.	31·52	27 0
21	W.N.W.	4·3	29·254	51 14	35·18	34 60	C B	31·34	27 2
22	N.W.	4·9	29 310	53·42	35·56	34·56	O M.F.	31·26	27·8
23	N.N.E.	2·0	29·030	45·77	32 72	32·03	O.M.F.D , 8 V.	30·95	27 0
24	S.W.	5·3	28·248	44·50	30 30	30·05	O M.F., LV., 4 S.	30 83	26 0
25	W.S.W.	2·6	29·184	53·13	33 73	33·57	O.M., C B.	33·40	26·8
26	S.W.W. / W.N.W.	4·9 / 4 0	29 542	55·68	38 55	37·92	C.B., O M., 1 V.	36·82	26 5

JOURNAL OF AN EXCURSION IN OMAN, IN SOUTH-EAST ARABIA.*

By Colonel S. B. MILES.

It is, perhaps, needless to remark that our present geographical knowledge of Oman, in Eastern Arabia, and especially of its orographical system, is derived almost exclusively from the map of Lieut. Wellsted, I.N., whose 'Travels in Arabia' was published in 1838. The value of the work accomplished by Wellsted has been universally acknowledged, and, considering the difficulties he had to contend with as the pioneer explorer, he deserves the greatest credit and commendation for the light he has thrown on the country.

Among the regions Wellsted did not personally visit, and consequently did not describe, is that portion of the great mountain chain which forms the backbone of Oman, lying between Maskat and Ras Al Had.

The system of mountains hereabouts is somewhat complicated, but may be said to consist broadly of two parallel ranges forming a continuation of the Jebel Akhdar chain, and embracing between them as far as Kuryat a rich and thickly peopled valley known as the Wadi Tyin.

This valley, which rises a little to the north-east of Semmed, terminates at Ghubra el Tam, where the torrent has excavated its way through the hills, forming a very remarkable cañon or channel, the seaward side of which is known to navigators as the Devil's Gap.

The exterior of this gap I had seen in 1874, in company with an officer of H.M.S. *Rifleman*—Lieut. Black, who afterwards unfortunately perished in the ill-fated *Eurydice*; but the opportunity of fully exploring the gorge and the Tyin valley did not occur until ten years later. In the month of February, 1884, however, I was able to make arrangements for the journey, and the Sultan H. H. Seyyid Turki appointed Seyyid Nasir bin Mohammed Al Bu Saidi to lead the escort, our guide and kefir being Shaikh Nasir bin Gharayib el Jabri, who was directed to join our party the next day at Natat.

It was on the morning of the 11th that we mounted our camels and rode out of Mattrah into the broad and shallow Wadi Harmal, or "Vale of Rue." Passing Felej castle and the village of Ruwi, one of the market gardens of Maskat, we strike off to the left up the Wadi Adi, a winding gorge or defile about 4 miles in length cut through the hills, which leads into and drains part of the small plain called Seh Natat, a basin or opening in the lofty and precipitous hills behind Maskat. The Wadi Adi, which has a rough stony bed of many colours, and the mural surfaces of which disclose a singular variety of geological strata, bifurcates at its outlet from the hills into two streams, the

* Map, p. 576.

torrent after heavy rain pouring not only into the Wadi Harmal, but also into the watercourse that runs by El Wateyeh.

At 10 miles from Mattrah, we arrive at Al Birain, a hamlet of the Beni Wahaib tribe, so called from two copious fountains issuing from the rocks hard by. From these springs two new felejes, or underground streams, have been conducted for the purposes of irrigation. The water being sweet and unfailing, orchards and gardens have been planted, and are thriving famously. Palms and various fruit trees, grain, and lucerne luxuriate here. A lofty tower, that indispensable and ubiquitous adjunct to an Arab settlement, without which the source of water-supply for the use of the inhabitants would lie at the mercy of their enemies, is being built on a gentle eminence, and will soon be completed. I had heard something about these felejes at Maskat, and was therefore much interested at seeing them. One of them was the property of a joint-stock company there, of which the Sultan's wazeer was the chief shareholder and promoter. The other shares were held by Indian merchants. The spring had been purchased from the Arab owners for a consideration, and I found that the shafts of the felej had been already sunk, and that the underground connections were in progress. The shareholders receive the water in their gardens in proportion, of course, to their interest in the company, the allotment being made every ten days. We halted here for the night. The elevation above the sea is 420 feet.

In the mountainous parts of Oman the roads run almost invariably along the beds of the hill torrents or wadies, which form the natural highways into the interior, and are sometimes sandy watercourses, sometimes deep rocky ravines, and sometimes broad fertile valleys.

Our second march was to lead us over the northern and more elevated of the two mountain ranges I have mentioned above, by the Kahza pass, which forms one of the main channels of communication between Maskat and the Sharkiyah, or eastern district of Oman; and as our day's journey was likely to be a long and toilsome one, we started early in the morning, and travelled in a southerly direction to where the Wadi Kahza enters the plain. This expanse is occupied not only with the usual stunted trees and shrubs of the wilderness, which are in this land never too abundant, and which have been here sadly diminished by the race of woodcutters who infest the neighbouring valleys to supply Maskat with firewood, but also with many singular natural pillars of considerable size, their surfaces indicating, with a precision that would be very interesting to a geologist, the composition of the surrounding hills.

We soon enter the Wadi Kahza, and commence the ascent up a gentle gradient along a good gravelly bed, treeless and waterless, cut through a deep bed of coarse conglomerate.

By-and-by we pass on our left the outlet of the Wadi Amda, which,

scoring the northern side of this range in a direction almost parallel with the Wadi Kahza, forms a shorter and more direct route to the Tyin valley. It is, however, a very rugged and difficult pass, the defile, I was told, being only a foot wide at one part, with a wall of rock on one hand and a precipice on the other. After a short rest under the grateful shade of a clump of large trees, we pursued our journey up the ravine for an hour and a half, the acclivity gradually increasing in sharpness as we proceed. Above us here tower two lofty peaks, one on either side, that to our right being a cap-shaped point called Jebel Sell. And now commenced the real struggle of the ascent, the zigzag path of which was so frightfully steep, and the footing so rugged and insecure, that the camels, though helped and encouraged with the utmost endeavours of the Arab drivers, only climbed it with extreme difficulty.

By the time we had reached the summit at 3 p.m. I was able to realize the truth of the warnings given me beforehand by the Arabs as to the perilous nature of this pass for beasts of burden, for the wayside was strewn with the whitening bones and skeletons of camels that had fallen over the edge and been left to perish. Fortunately, we had no fatal accident, though five of the animals fell during the ascent, and bruised their legs. The elevation of the Akabat el Kahza I found to be 3900 feet; but Jebel Tyin, which stands in front of us, is a giant by comparison, and rears its head to an altitude of 5250 feet. Just as we mounted the top we met Shaikh Saud bin Hamad of the Rehbiyin tribe, who was on his way to Maskat to solicit pardon from the Sultan for his perfidious conduct in opening the road to the rebel army on their way to besiege that town in September, 1883, on which occasion they were completely defeated. The Rehbiyin tribe have for many centuries possessed and occupied the Kahza pass, and have always been in receipt of an annual subsidy for holding it closed against the Sultan's enemies. The rencontre with our party did not appear very pleasing to the shaikh, who had always been profuse in his protestations of loyalty to the government, and after a hasty salutation he commenced to descend the path by which we had ascended.

With our faces still towards the south, we crossed the ridge and began to move down the Wadi Mugheira, a ravine which I found, to my surprise, to present not only a more severe gradient, but even a more rugged and formidable path than the Kahza. The banks are as steep as if artificially scarped, for the stratification is vertical or at very obtuse angles, and runs parallel to the direction of the wadi. Shapeless blocks of blue limestone, large enough to form a serious obstacle, are piled up in profusion in the rocky bed, rendering our progress very slow. Patient and docile as the camels were, it seemed impossible sometimes that they could extricate themselves from the confused masses of rock among which they appeared to be entangled, and keep

their feet on the slippery water-worn stones; but their drivers managed to get them through without mishap.

Owing, perhaps, to the protection afforded by the rugged nature of this torrent bed, and also to the presence of pools of water among the huge rock fragments, vegetation is tolerably abundant—tamarisks, oleanders, kafas, euphorbias, the tirucalla or milkbush, rhamnus, and acacias are the most common and characteristic, but many others I did not know are to be seen.

It was nearly sunset before we were able to remount our camels, and quite dark before we reached the foot of the Mugheira ravine, where we were to camp. Here we found water, but no shelter, and as it was too late to look about, we lighted fires and bivouacked for the night. Our camping-ground was 2070 feet below the summit of the Kahza pass, and the air was cold and humid here, owing to the quantity of vegetation and the numerous pools of water around.

On the following day we retraced our steps for a short distance, and then, turning to the south-east, began to ascend the Wadi Mansab, a broad highway with a slight acclivity and smooth, sandy bed, offering an excellent road. This wadi flows into the Wadi Semail near Surur, and forms, indeed, the principal route between the Tyin and Semail valleys. There are two large villages, Subh and Nafaah, in it, besides several hamlets, and it is fringed along the greater part of its course with fine date groves. I had been advised at Maskat before starting to travel by the Semail-Mansab route as the more easy and convenient way, but I had decided on taking the shorter though more troublesome route, as I was anxious to examine the Kahza pass, which I had never seen, while the Semail valley was very familiar to me. The nejd or upland of the Wadi Mansab was reached in two hours, and we soon espied in front of us the village of Al Wasit, belonging to the Rehbiyin, where I intended to halt.

The quarters assigned to me were in a pretty orchard composed of numerous fruit trees interspersed with flowering shrubs and plants, and here I soon made the acquaintance of the whole community, a very small one certainly, who crowded round to see their first English visitor. Our march this day had been a very short one, only 6 miles, as the camels wanted rest after the fatigues of the Kahza pass. Al Wasit is a picturesque little place in itself, but its surroundings are bleak and desolate in the extreme. Situated on the barren slope of the mountain range, nothing meets the eye but dark masses of hills, exhibiting no signs of human habitation, and decked with but scanty verdure. The head shaikh of the tribe resides here with his attendants, but there is no village, as the paucity of water does not admit of a large population. One little rill trickling from a neighbouring glen is allowed to collect in a reservoir, from which it is drawn economically for domestic use and irrigation. Notwithstanding its apparent insignificance, however, Al

Wasit is much frequented by native wayfarers and traders, as well as by the chiefs of other tribes, who come to visit the influential Shaikh of the Rehbiyin, Salim bin Hassam bin Mohammed, who at this time happened to be away.

On occasions when the martial tribes of Al Sharkiya contemplate rising and marching on Maskat with the object of extorting concessions from the Sultan, or of ousting him in favour of some rival, it becomes a matter of importance to gain over the tribes holding command of the various mountain passes through which a passage for the invading army must be purchased or forced. Most of the tribes holding such passes as Akk and Kahza are in receipt of a regular stipend from the Maskat government to keep them closed against the tribal coalitions on the war-path, but this precaution does not always avail. In September, 1883, the Rehbiyin tribe had played false to the Sultan, and, though in receipt of a good subsidy, had listened to the cajolements of Seyyid Abdul Aziz and Shaikh Salih bin Ali, and had given passage to the enemy, whereby they had been able to pour down the Kahza pass with such secrecy and dexterity as to take his Highness by surprise. The attack, however, owing in great measure to the support afforded to the Sultan by H.M.S. *Philomel*, which shelled the rebels from their position, an action fully approved by our Government, had signally failed. Some of the rebels had been already chastised, and the Rehbiyin, among others, were still afraid of reprisals against themselves.

February 14.—The road hence to the Wadi Tyin led us in a south-easterly direction down the Wadi Wasit, a well-wooded shallow water-course with a few palms. Leaving this nullah through a small gap between two vertical cliffs of white limestone, we arrive, after a short ride, at Naksa, a hamlet lying at the angle formed by the junction of the two wadis, and, passing this, we find ourselves at once in the stony bed of the Wadi Tyin. To our right, some little distance up the ravine, is a village called Baad, which is the highest settlement belonging to the Tyin tribes; but the source of this wadi is at Rautha, further south.

Beneath us now lay stretched, in all its picturesque beauty, one of the largest, most beautiful, and most populous valleys in Oman, the Wadi Tyin, a broad, straight vale lying between two mountain ranges, and extending north-west and south-east for a distance of nearly 25 miles. This rich oasis contains twenty-nine villages belonging to the Rehbiyin, Beni Arâba, Siâbiyin, Nahaya, and Beni Battâsh tribes, embosomed in dense palm groves, with orchards and fields of varied cultivation. Many of these settlements are concealed in the secluded and secure ravines which deeply gash the mountain slope on either side of the valley, but many others extend along the fertile bed, their orchards and plantations fringing the oasis at intervals for miles. It is watered by no less than 360 springs according to the Arabs, with whom this number is a conventional one, and though it does not possess a

broad continuous river, the supply of water in the bed is perennial and abundant, flowing sometimes on the surface, sometimes disappearing in the porous soil. The northern of the two ranges holding Wadi Tyin between them is known in the valley by the name of Jebel Beida, or the White Mountain. It is tabular, and appears to be mainly composed of limestone in horizontal stratification, the average height being perhaps 3000 feet. Arid and sterile as these hills look, they are nevertheless inhabited by a considerable population of shepherds and goatherds, who rear large flocks. Their dwellings are mere oval shanties constructed of loose stones, and they subsist on the flesh and milk of their animals, cultivating only a few vegetables and indigo, which is in extensive demand in the valley. The crevices and hollows in the hills produce an abundance of thorny undergrowth and coarse herbage, from which the goats manage to extract food and nutriment in the most inaccessible spots. But the botany here and throughout the hilly districts is decidedly limited in character, and there is no great variety of species: indeed, the French botanist, Aucher Eloy, reckons that the total number of species in Oman does not extend five hundred. The usual vegetation here consists of colocynth, rue, acacia, vera and arabica, aloes, calotropis, senna, liquorice, euphorbia, brambles, sidr or rhamnus, and others. The wild animals are the ibex, called wail of the Arabs; the wild goat recently identified by Mr. Oldfield Thomas, and named after its discoverer, Dr. Jayakar; hares, foxes, hyenas, etc.

The range on the southern side of the Wadi Tyin is known to some as Jabel Hallowi, to others as Jebel Sauda. This range forms a minor spur from the great chain striking off near Zikki. Its mean height appears to be about 2000 feet, and it has no peak of any great altitude. On the southern flank, which merges gradually into the desert, it throws out several large shallow watercourses, such as the Wadi Andam, Wadi Beni Khalid, and Wadi Halfain, all flowing to the sea south of Ras al Had. The dwellers in this favoured vale, the Wadi Tyin, have made the most of the natural advantages and capabilities of their rocky home, and have, with the indomitable energy and perseverance of the Arab character, industriously laboured to produce all that the fertility of the soil, conjoined with warmth of climate, is capable of. In addition to the usual grains and vegetables raised in Oman, they cultivate kumkum or turmeric, sugar-cane, bastard saffron, and henna. But it is to fruit culture that the Arab specially devotes his attention. The date, the most characteristic tree of Eastern Arabia, ranks, of course, first, and the vast assemblage of palms in this valley is very striking. Vines, peaches, apricots, custard apples, guavas, figs, pomegranates, plums, limes, sweet limes, quinces, oranges, bananas, citrons, mangoes, melons, and mulberries are also cultivated, and with considerable success.

We now pass, at a rapid trot, several villages in succession, each

embowered in an umbrageous date grove, the water here perennially flowing in a copious stream. The first village is Al Bir, with a watch-tower perched on an eminence commanding an extensive view down the valley, and having an aqueduct raised on stone pillars crossing the road. At this point the valley is 1900 feet above sea-level. Nestled in a corner is a town called Miss, inhabited by the Beni Jabir, with beautiful orchards, and enshrined in a little forest of date-palms, which rear their graceful crests over it as if to shade it from the scorching rays of the sun. As our guide, Shaikh Nasir, belonged to this tribe, we were heartily welcomed by the people, and invited to stop, but this I was obliged to decline.

Almost adjoining it is another town with a good cluster of houses, and possessing a masonry aqueduct built up 20 feet above the bed of the wadi to feed the palms and cultivation, a work of considerable pretension for such a place. We halted at Sibal, a fine, large village some miles further on, with an abundant supply of water, and every kind of fruit growing in the gardens. The venerable and courteous chief of this place, Shaikh Mesud, who had met us on arrival, furnished me with a comfortable hut to lodge in, and after we had sat together for a little time to drink coffee, took me for a walk round the town. There are some substantial houses in it, four mosques, and several *sablahs*, or meeting-places. The shaikh pointed out Akabat Amda, which bears a little to the north-east, and informed me that another pass called Akabat Mankal lay almost opposite Sibal and eastward of Amda; he said it was steeper than the Kahza, and was formed by two ravines, viz. Wadi Tima, running into Wadi Tyin, and Wadi Sarreya, on the Kuryat side. The shaikh was acquainted with three roads leading from Wadi Tyin to Al Sharkiya, two of which branch off from Malhalhah, and one from Gubra el Tam. There is much traffic between Al Sharkiya and Maskat by these passes, the roads converging at the Akabat Amda on the northern range, which forms the most direct passage.

In other parts of Oman I had found that certain tribes, particularly those who possessed large herds of camels and droves of asses, had obtained, in the course of ages by length of usage, peculiar privileges throughout the country as carriers of merchandize, but in this valley I could hear of no tribe that could boast of this privilege; all the traders, pedlars, and peripatetic vendors of goods being Mekrani Beluches, who act as agents or travellers for the Hindu and Khoja merchants of Maskat and Kuryat, the latter never venturing to penetrate into the interior of Oman themselves. Collecting from the various settlements in the valley and adjacent parts, the fruits and other produce of the soil, these Beluches bring back in return the sugar, oil, cloth, metals, and other commodities required by the people, though the large Arab proprietors have, of course, direct transactions with the Banians.

The name of this place is suggestive. In the Omani dialect, Sibal means an ape or monkey, and it was the name of a famous idol worshipped by the Arabs in pagan times before Islam. As there are no monkeys in Oman, it is possible that here in ancient days stood a temple dedicated to that image.

Sibal is 1500 feet above the sea, and is distant from Al Wasit about 13 miles. The journey hence to Ghubreh el Tam took us five hours, the distance being about the same, and the aneroid showing a fall of 500 feet in elevation.

From Sibal to Ghubra el Tam the valley continues to present the same character as in its upper part, occasionally contracting and expanding, but on the whole widening considerably as we proceed eastwards, while the hills on either side maintain their altitude. Water is abundant everywhere, in pools and in motion, and many streams pour down from the hillside to swell the volume of the main torrent in flood-times. We pass many villages on our way, cultivation and palm groves alternating with desolation and arid rock. Two of the settlements of the Beni Battash, Hidda and Akdah, are so close together that they form but one large town extending for upwards of a mile, picturesquely flanked by two lofty watch-towers, which command the approaches and guard the water-supply. We were riding slowly and peacefully past Akdah, when our advance was suddenly and unexpectedly challenged by the inhabitants, who, either from panic or some other cause, gathered on the road in front of us in great excitement and offered to bar our progress, firing their matchlocks in the air and brandishing their spears and swords frantically, as if we deserved instant annihilation. This insult on the part of the people greatly provoked Seyyid Nasir, who abused them roundly, and could not conceal his vexation. However, it soon appeared that the noisy demonstration was not of an alarming nature, and as the shaikhs and elders of Akdah used their efforts to quiet the mob, the storm was soon over, and we proceeded quietly on our way. I did not mention the incident to the Temima of the tribe, Shaikh Shamas, when we met next day, but he heard of it from others, and was greatly ashamed of his people's conduct. He apologized to us for it, and announced his intention of punishing those concerned, but I doubt if he possessed the power of doing so.

The town of Ghubra el Tam is very picturesquely situated on the skirt of an eminence, which, lying at the end of the valley and thus forming a barrier against the onward progress of the stream, has caused it to swerve to the northward and cut its way through the mountain range down to the sea. It has some good houses and a population of over a thousand of the Siâbiyin tribe, and is protected by a strong fort of oblong shape perched on the western extremity of the hill.

At this time there was very little water in the wadi, the unusual

dryness of its bed being due to the severe and long-continued drought, from which this part of Oman had been suffering, and our party were congratulating themselves on having arrived at such an opportune time for passing through the gorge, when their joy was suddenly turned into dismay by a slight shower of rain which fell in the evening. The clouds now began to gather so ominously in the sky, that if it had not been so late I should have pushed on at once without halting. It had, however, already become too dark to permit of this, and with some foreboding—for the intensity of the heat seemed to threaten a thunder-storm—we took up our quarters for the night in the habitation our hosts the shaikhs of the town had allotted to us. Had it rained heavily, as many of us fully expected, I should have had to wait here until the torrent had subsided sufficiently to allow of our proceeding through the gap, which would undoubtedly have entailed a delay of several days.

The exploration of this cañon had been one of the main objects of my journey, as it had not before been traversed by a European, so I was resolved to seize the present chance of visiting it at all risks. Fortunately, the night passed without the expected downpour, and though the morning of the 16th broke gloomily and lowery, the rain still held off, and the stream flowing at our feet had risen but slightly. After a consultation, we deemed it best to face the peril of a sudden rush of water through the gorge, and hazard the passage before the storm, which now appeared inevitable, could burst upon us and unite the rills and streamlets of the valley into a swift and overwhelming torrent. Having hastily loaded the camels, therefore, we started early, and crossed the bed of the wadi, in which the water was running a little over 2 feet deep, just opposite the town. We then found ourselves at once at the entrance of the great cleft, which is as sharp and abrupt as if we were entering the portals of some monstrous castle and stood immured within its massive walls. Towering loftily, sheer and perpendicular above the narrow floor, the huge walls of rock give the appearance as if the mountain range had been suddenly split in twain from the base to the summit by some convulsion of nature, exhibiting a singular illustration of impressive grandeur. The breadth of the passage here is about 100 yards, but it varies throughout its length from 500 to 150 yards, while the cliffs rise to an altitude of from 1000 to 1500 feet, as near as I could judge. The stream appeared to flow 4 or 5 miles an hour, and gradually increases in volume as we progress, being fed by the springs of water which burst from the crevices in the walls. Throughout the chasm the camels were wading nearly up to their knees.

After riding along this grand and curious gallery for a quarter of a mile, we are told to dismount, having arrived at a sort of deep step or waterfall called the Akaba. Here the camels are relieved of their baggage and saddles, and are taken along a ledge of the precipice on the left bank which leads circuitously to the bed further on, while the

men of our party are let down by a rope over the projection on to the floor of the wadi below. This remarkable step or fall in the rock offered a very serious impediment, as it was of considerable depth, while huge blocks and fragments of blue and white limestone, that had fallen from above, added to the difficulty, and presented an obstacle which was absolutely insuperable to the camels, even when freed of their loads. The path leading to the fall, along which we had to scramble, was so rugged and slippery, and the cliff was so smooth and waterworn, that even the Arabs, who are as nimble as cats, did not find it easy work.

The solicitude evinced for my safety, not only by my own party, but also by the Siâbiyin who had accompanied us from Ghubreh, was almost touching, though the descent could not in fact be called perilous. Indeed, throughout my excursions in Oman, I always had reason to be grateful to the Arabs of my escort, and not unfrequently to the local Arab shaikhs, for their zeal and self-sacrifice on my behalf. They never resented the inconvenience and fatigue I often caused them, but deferred without question to my wishes as to the when and the whither; while on any occasion of unusual toil or danger, they seemed to regard my safety and comfort as a main point of consideration.

At the bottom of this pass, called Al Makuba by our Siâbiyin guides, we waited an hour for the camels, which, though carefully led by the drivers, did not traverse the narrow and dangerous ledge on the other bank without serious difficulty and hazard. Fortunately, however, they arrived at last in safety, and the baggage, which had in the mean time been lowered down by the Arabs, having been replaced, we mounted and resumed our journey.

The channel is here at its broadest, but it narrows further on, and becomes gloomy and cavernous, the mountain frowning above to a height of about 1500 feet. The cliff on the right bank at this part is known as Hail el Kebir, that on the left as Hail el Harim. Winding along this stupendous chasm, we occasionally have to encounter immense fragments of rock, piled in confusion on the floor, and obstructing the road, while above us are to be seen curious crags, overarching rocks, and other peculiar features of natural architecture. There is no lateral opening throughout the entire length, and only one small ravine falls into it, this being on the left bank. The geological structure of this range, as disclosed by the walls of this chasm, is mainly limestone, superimposed, probably, on the plutonic formation of which the rocks at Maskat are an outcrop. The lowest stratum to be seen is conglomerate, the upper layer of which is arenaceous. Overlying this with a horizontal stratification are courses of limestone, white or blueish, the upper rocks appearing to be of a reddish colour.

As may readily be supposed, the heavy and tumultuous torrents that frequently sweep the bed preclude the possibility of trees and plants

surviving the rush of water, and we consequently find here no vegetation whatever. Even the long period of three years that had elapsed since the last flood had not produced any sign of bush or reed that I could see.

After heavy rain, the volume of water flowing through this chasm must be enormous, and the surging and raging torrent must then be a magnificent sight. It not unfrequently happens that travellers and caravans coming from Kuryat are engulfed and overwhelmed by the sudden rise and rush of the stream, as the innumerable tributaries and affluents in a drainage-area of some 200 square miles, swelling after rain, would concentrate at the gorge with marvellous rapidity and force, and form a mighty and irresistible wave, destroying everything in its path.

This effort of nature to provide an outflow for the pent-up waters of the Tyin valley through a mountain range is the most singular specimen of earth-sculpture I have seen in Arabia, and consists, in short, of a narrow, winding, vertical-sided gallery or cañon, extending for about 6 miles in a north-east and south-west direction, excavated through the solid limestone rock by the erosive action of water in a period of countless ages.

The peculiar character of this chasm, and the grand and picturesque scenery of its surroundings, create an impression on the mind which is not easily effaced. The Arab name for it is the Wadi Thaika, meaning the "Strait or Narrow Torrent."

It was one o'clock before we emerged from the cañon, our rate of progress in it being necessarily slow, and we found the opening at this end less abrupt than at the other, the walls gradually receding on each side and declining in altitude as we proceed. The high point of the range, known as Kuryat peak to navigators, and to Arabs as Jebel al Zatri, now lies to our left, and raises its head 6200 feet above us, falling in terraces to the plain, while the mountain cliff to our right over Dagmar has been reckoned at 4000 feet.

Winding round a low hill, we come all at once upon the town of Mezâra, the chief settlement of the powerful Beni Battash tribe, surrounded by thousands of date-palms, rearing their tufted heads in a dense grove; and so sudden and unexpected is our appearance, that no little commotion is caused among the inhabitants, who fly to arms, and rouse themselves into an absurd fit of excitement. Much firing and shouting ensues, but the hubbub evaporates on the appearance of Shaikh Mohammed Adi, who holds this part of the town, and who is most pressing for us to be his guests and remain the night.

But Seyyid Nasir whispers to me that the two shaikhs are not on good terms, and suggests the expediency of moving on to the castle. We accordingly politely decline Shaikh Mohammed's invitation, and ride up to the spot where Shaikh Shamas bin Mohammed, the temima or paramount chief of the tribe, is awaiting us.

I had known this venerable and noble-looking shaikh for many

years, as he often came to Maskat, and I had learned to like and respect his character. His reception now was most cordial, and I was much gratified at it, as it greatly increased the pleasure I felt at being able to pay him a visit in his own home. As we halted and dismounted on the bank of a small but rapid stream that intersects the plain and winds among the palm groves and settlements, Shaikh Shamas came down from his castle at the head of a long procession of his people, and gave Seyyid Nasir and myself a hearty welcome. With a levity and humour uncommon among Arab shaikhs, who are usually grave and dignified, he put his hands on my throat and declared he would throttle me if I did not promise then and there to spend a day with him and accept his hospitality. There was no disputing with him on this point, so, having been carried over the river by his men, I walked up the eminence with the shaikh and Seyyid Nasir, followed by a dense crowd of Arabs to the fort. Just as we approached it, an old twelve-pounder gun lying unmounted on the ground in front of the gateway was fired off in honour of the occasion, the report reverberating finely among the surrounding hills. From this gateway, and in a higher degree from the roof of the castle, the landscape presented to the view is one of exceeding beauty. The town is situated in a small circular plain, the low hills encircling which, with their dark background of lofty peaks and tabular mountains, render it invisible from the sea, and constitute a natural fortification, giving an assurance of peaceful security. The lower part of the plain is filled up by habitations, plantations, orchards, and cultivation, while standing high on the east side is the castle, square, substantial, and imposing.

The temima took us into his reception-hall, where we sat down to talk while coffee was being roasted, pounded, and boiled at the other end of the room. The interior of the castle does not accord with the pretension of its external appearance, for it is but scantily furnished and decorated, and can boast of but little comfort. Chairs, sofas, and furniture, as we understand it, are not to be found in the shaikh's residence, for the Oman Arab is a plain man, simple in his habits, and free from ostentation; his wants are few, and, however well off he may be, he does not indulge in luxurious sloth, or surround himself with many articles of needless luxury. Even the women's apartments are bare and empty; a carpet, a box of clothes, and articles of domestic use are the only things to be seen. The temima, however, was extremely courteous, and treated us very hospitably.

He informed me that the abutment of the range on the north-west side of the Thaika gap was called Jebel Nuwai, and that on the south-east side was Jebel Naab; the Beni Nuwai and Beni Naab being two of the pastoral tribes who occupy the tableland of these hills, and subsist on their flocks of goats and sheep. These shepherds are probably of mixed Arab and aboriginal descent, and form the main

following in war of the settled tribes in the neighbourhood, of which they are, in fact, the Bedouin portion.

Mezara greatly charmed me by its quiet beauty. The rich orchards and gardens and the rippling brook made the locality very delightful and attractive, and I almost envied Shaikh Shamas his residence in so favoured a spot; but, shut in as it is by hills, I should imagine it to be excessively hot and oppressive in the summer months. Just below the town is an aqueduct on five arches, constructed a few years ago for the purpose of leading water from the stream to irrigate the cultivation. Running into the Thaika valley beyond Mezara is a ravine called Wadi Khabba, with a large village of the same name; and under the lofty cliffs to the south-east of Hail are Wallja and Sunt, the latter belonging to the Sâbiyin tribe.

Good fortune had befriended us in allowing our passage through the dreaded Thaika without being overtaken and submerged by a flood. We had, however, only just escaped in time, as the heavy masses of clouds which had been brooding over us since yestermorn began now to descend in a deluge, and a grand thunderstorm broke upon the hills and valleys.

The rain continued all the afternoon, and was most joyfully welcomed by the Arabs, who naturally looked on our arrival in their town as a propitious omen.

Our departure from Mezara the next day was accompanied by the same demonstrations of friendship as our arrival, and, after taking leave of our hosts, we mounted our camels in the presence of the whole community. For 5 or 6 miles our course led along the bed of the river, which, known above as Wadi Thaika, receives here the appellation of Wadi Hail. The banks near Mezara are about 1000 feet high, and perpendicular, but they continue to decrease in elevation and to broaden out as we advance seaward. Along the left bank runs a fine masonry felej, with shafts to raise the water at intervals, recently constructed to replace an old one built by the sultans of the Yaareba dynasty, two centuries before, and now fallen into decay. It soon leads off northwards to supply the gardens and groves of Hail el Ghâf.

On arrival at the settlement, we were met by Seyyid Hilal bin Said bin Hamad and his two brothers, and were escorted to a building forming a single spacious reception-room, situated in a pleasant garden. Here we sat and rested for several hours, enjoying the fragrance of the flowers and the balmy atmosphere of this salubrious spot.

The Hail el Ghaf settlement is said to have been founded by Seyyid Khalfan Al Bu Saidi, a notable man in Oman in the early years of this century, who took a conspicuous part in cementing the friendship of the English with the Maskat government, he being at that time wali or governor of that town.

Prior to the selection of this locality for building and planting by

Seyyid Khalfan and his family, Hail el Ghaf was merely a patch of elevated ground, partly surrounded by the wadi, and covered with a thicket of acacia trees (ghaf), from which circumstance it derives its name. The land was purchased from the Beni Battash tribe, who, however, retained a portion of it, and still exercise a sort of protection over the place. The benign sway of the Al Bu Saidis, and the liberal manner in which money has been expended, have caused the village to flourish and the population to increase to its present number, about 1200 souls.

Hail abounds in orchards and cultivation, and a vast quantity of fruit and vegetables are sent to the Maskat and other markets. The Arabs are as passionately fond of flowers as they are of strong perfumes, and take great delight, when they can afford it, in horticulture. The number and variety of fruit and flower trees, imported at various periods from Persia and India into Oman, testify to the appreciation by the Arab of these plants, and to the care bestowed on them. The "bostans" or gardens, therefore, as may be supposed, absorb most of the time of the aristocracy of Hail, who seem to take the keenest enjoyment in tending their roses and jasmine, and in spending the livelong day in the shade of their *sablahs* or summer-houses. The most beautiful feature in the vicinity of Hail is a broad, straight avenue of superb mango trees over two miles in length.

At 4 p.m. we started for Kuryat, where I intended to pass the night, and on the way we encountered another thunderstorm and heavy downpour of rain, which drenched us through. It was hailed as a blessing by the Arabs to the parched and thirsty soil, and their loud exclamations of gratitude sufficed to reconcile us to our discomfort. We rode fast to escape the deluge, and covered the 12 miles between Hail and Kuryat in an hour and a half.

I took up my quarters in Seyyid Hamad bin Khalfan's large house, which is fortified with two towers, and here I was detained the whole of the following day by the rain, which fell in torrents and without intermission, much to the delight of the inhabitants, but somewhat to my annoyance, for I had visited Kuryat on many previous occasions, and knew it too well to desire its further acquaintance. This town lies 31 miles south-east of Maskat, and is situated about a mile from the shore, on the maritime plain lying between the great range and the sea. The plain contains about a dozen hamlets, and is intersected by two wadis. It forms an extensive pasture-ground, on which in former days an excellent breed of horses was reared by the inhabitants, who exported them from Kuryat in considerable numbers to Surat to supply the Indian market. Chiefly owing, I believe, to internal dissensions, this trade became very precarious, and ultimately came to an end about two centuries ago. The population of Kuryat is 3000, and it has a good bazaar with several shops belonging to Hindu traders, who supply the settlements in the Wadi Tyin and in the hilly districts

east of Maskat with foreign merchandise, the Wadi Tyin being the main artery through which the traffic between Kuryat and the interior passes. This port and Sur are the Karteia and Tsor, the Carthage and Tyre, of the race whom we know as the Phœnicians, and who, as far back as the time of Solomon, or earlier, had trading-stations along the southern coast of Arabia. They are undoubtedly of great antiquity, and retain their primitive names to this day. Their convenient and important position on the Arab coast just opposite India, must, like Kilhat and Khor Jerama (Corodamon), have led to their early occupation as trading depots by the merchants of those times who were engaged in exchanging the productions of the East and West.

The sun rose on the 19th in a clear sky, and we were soon beyond the outskirts of Kuryat, ascending the Wadi Mijlas, a deep and narrow ravine which leads in a tortuous fashion and in a generally south-west direction to Sawâkin, whither the Wali of Kuryat accompanied us on horseback. Sawâkin is a small and pretty hamlet, and forms a triangle with Hail el Ghaf and Kuryat, from which latter town it is 9 miles distant. Here, enshrined in a fine plantation of palms, is a large house built by Seyyid Said bin Khalfan, who used this charming and peaceful retreat as his country house in the hot weather. After an hour's halt at Sawâkin, we leave the Wadi Mijlas, and, striking off to the west, traverse a rough, desolate, and very broken country, a confused mass of ridges and hillocks of limestone, the strata of which appear to slope generally southwards. We twist and turn along the watercourses, which, adorned with dwarf acacias, thorny shrubs, and jungle herbage, intersect the country.

We pass several villages on the road, Heither, Muntheriya, and others, all belonging to the Beni Wahaib and Beni Hassan; and about halfway to Maskat, Sarraya, a small town of cloth-weavers, is pointed out in a well-watered and fertile ravine 6 or 7 miles away to our left. In the evening we reached Al Hajar, a village in the Wadi Hatat, where we camped for the night. It is a comparatively new settlement, for when I first visited the spot in 1876, the ground was being prepared to receive Busreh date-palms, and a felij, half a mile long, had been projected and commenced by Seyyid Hilal bin Ahmed, who had purchased the fountain from its proprietors, the Beni Wahaib. Though water is very plentiful and the soil tolerably productive, the plantations did not appear to have thriven as well as might have been expected. The felij was destroyed, it seems, by a flood soon after it was completed, and had to be rebuilt, and other causes have combined to retard progress; but, like its neighbour Al Birain, which I have mentioned before, it struggles on, and is fairly profitable to its enterprising founder. Tobacco is one of the chief articles cultivated about here, and is grown for the Maskat market.

The Wadi Hatat, in which we now stand, extends, under its various

names of Wadi Kahza, Wadi Hatat, and Wadi Maih, from Jebel Kahza to Yiti, being joined on the way by the Wadi Amda and numerous other ravines. At the foot of Wadi Kahza the hills open out, and a small plain is formed 9 or 10 miles long called Seh Hatat, which has been the scene of many a sanguinary battle in Oman history. It contains several villages and much cultivation, and is possessed by five tribes, viz. the Beni Wahaib, Beni Hassan, Beni Jabir, Beni Battash, and Al Maashera.

The range to our left, on the other flank of which runs the Wadi Tyin, and to which the Rehbiyin and Siâbiyin tribes gave the general name of Jebel Beida, is not known by this name to the Beni Wahaib, who, indeed, could give me no appellation for it.

The Wadi Maih, which extends from Al Hajar to the sea at Yiti, is a narrow vale about 9 miles in length, with a rough stony bed and a fast-flowing stream of water, in which the fragrant and ubiquitous oleander is extremely abundant. It is in general barren, with occasional patches of cultivation. The hamlets in it are Al Mezra Alowi, where the orchards are walled or revetted up on the banks to preserve them from the encroachment and rush of the torrent; then El Mezra Sifala, then Rijaa, and then Yiti.

The geology of the Hatat valley is extremely curious and interesting, as it exhibits on the one hand the nature and stratification of the sedimentary rocks, of which the great mountain chain of Oman appears to be principally composed; and on the other, the metamorphic or igneous structures forming the dark group of hills at Maskat. The bed of the Wadi is throughout of limestone pebbles, underneath which is a coarse conglomerate. The hills are most varied in colour, and the strata lie at all angles.

In the Seh Hatat there are many curious natural pillars about 25 or 30 feet in height, standing some distance apart, and apparently the effect of denudation, the general aspect of this plain suggesting the idea that it may have been in remote times the basin holding the drainage of the surrounding hills in the form of a lake, until the eroding action of the water had excavated its way through the Wadis Maih and Adi down to the sea.

Near Al Hajar the limestone rocks were of a reddish tinge, and appeared to be mixed with layers of blue mud.

In the Wadi Maih the mural section shows the plutonic action in a most unmistakable form, the rocks being all confused and crumpled up, and the strata lying in folds or arches, as it were, over huge blocks of limestone.

We left Al Hajar the following morning, and pursued a course varying from north-west to north. After passing Al Birain, we enter abruptly the defile of Wadi Adi, and then, turning down the Seh Harmal, we soon arrive at Muttrah.

DR. JOHN MURRAY ON THE MARINE FAUNA OF THE KERGUELEN REGION.

In prompt fulfilment of the oft-repeated promise that the 'Summary of Results' was not his last word about the *Challenger* Expedition, Dr. John Murray publishes in the *Transactions of the Royal Society of Edinburgh* (vol. xxxviii. pt. 2), an elaborate discussion of the deep and shallow water fauna of that part of the Great Southern Ocean which lies to the south of the Indian Ocean. The facts concerning the zoology of this area, called for shortness the Kerguelen Region, are almost wholly derived from observations made by the *Challenger* during her brief reconnaissance in higher southern latitudes in the early part of 1874, and Dr. Murray's work impresses us at the outset with the enormous wealth of scientific result he has obtained from what was at best a mere dip into a region of the globe still almost wholly unexplored. The paper consists chiefly of a masterly treatment, by statistical methods, of the lists of genera and species obtained within the area, in such wise as to bring into striking prominence certain remarkable features of the distribution of various forms of life; and these, again, are compared with results obtained by similar methods for other meridians in the same belts of latitude. Prefixed to the zoological investigation is a review of the present state of our knowledge of the hydrography and meteorology of the Great Southern Ocean as a whole; and a concluding section places the research in its position as a contribution to the early history of the planet, on the lines sketched by Dr. Murray at the meeting of the British Association in 1894.

No argument could more clearly set forth the almost incalculable value to science of the results we may expect to obtain from an exploration of the unknown South, even if the crossing of Antarctica itself should prove impracticable, and the highest latitudes remain untouched. And at a time when some attempt seems likely to be made actually to begin the colossal task, no clearer or more authoritative statement could have laid down the actual lines of the work to be undertaken in order to ensure results of the maximum value. If the proposed German Antarctic expedition makes Kerguelen island its head-quarters, as is contemplated, Dr. Murray's paper will greatly lighten the preliminary labours of its scientific staff, inasmuch as the great points at issue, raised by the few observations already extant, are perfectly clear, and no doubt can remain as to what is to be done.

The Great Southern Ocean, constituting nearly one-fifth of the total water surface of the globe, is a practically continuous belt surrounding the world between 40° S. lat. and the Antarctic Circle. So far as is known, the bed of this ocean shoals gradually towards the Antarctic continent, with shallow plateaux in places, as around Kerguelen, and hollows like the Ross Deep and Barker Basin, but nothing of the nature

of an enclosed submarine basin, like the Norwegian Sea of northern latitudes. The most southerly soundings of the *Challenger* show that in the higher latitudes the bottom is covered with a deposit of blue mud, in which are embedded many rock fragments—detrital matter from Antarctica, whereof the lithological character indicates that it came from a true continent, and not from a group of volcanic islands. The blue mud probably forms a belt 200 miles in width around the entire continent; north of it is found diatom ooze, which extends in places up to 40° S. lat., but is usually replaced about the fiftieth parallel by globigerina ooze. The blue muds with rock fragments indicate a sea much frequented by icebergs. The diatom ooze shows the presence of surface waters of low temperature and salinity, and the globigerina marks the transition to the warmer waters of a temperate zone.

The climate of the Great Southern Ocean is controlled by a belt of low barometric pressure, extending right round the globe between 40° and 60° S. lat. Direct observation does not as yet take us beyond this latitude, but there is every reason to suppose that a vast anticyclone rests over the Antarctic continent, and the brave west winds are therefore probably fed by the outflowing air from the high-pressure belt at the root of the trades on the one hand, and from an Antarctic anticyclone on the other. The result is a system of permanent winds of extraordinary intensity, and at the surface of the sea a series of well-marked drift-currents are produced, the circulation of water being the mirror image of the circulation of air. Thus the belt of low pressure, while it delimits one of the great regions of ascending air, marks a region of descending water, and water which under the surface conditions has probably become heavily charged with oxygen in solution. It seems necessary to accentuate the importance of this fact in relation to the broader questions of distribution, in order to urge that any expeditions visiting those regions should be equipped with the means of collecting proper samples of water for the analysis of the dissolved gases. The unusual complexity of the joint effects of temperature and salinity upon the density of the waters, derived by the active mixture of supplies from two sources, suggests that the final description of the circulation will largely depend on the results of analyses of dissolved nitrogen and oxygen. This is distinctly the case in some questions of the mixture of Atlantic and polar waters in the Norwegian Sea, and the absence of submarine ridges, and the greater vigour of the propelling forces at the surface, must make the identification of waters in the Southern Ocean considerably more difficult.

With this introduction, Dr. Murray proceeds to give ten exhaustive lists of marine forms known to occur within the Kerguelen Region of the Great Southern Ocean as above defined, viz. Metazoa procured by the *Challenger* in depths exceeding 1260 fathoms; Metazoa procured at depths exceeding 1000 fathoms, south of the tropic of Capricorn, excluding the

Kerguelen Region; Metazoa procured in depths between 150 and 1000 fathoms in the Kerguelen Region, and in depths less than 150 fathoms; Metazoa recorded as occurring within the Kerguelen Region by observers other than the *Challenger;* identical and closely allied species found in the extra-tropical regions of the northern and southern hemispheres, and unknown hitherto within the tropics; Foraminifera observed in the deposits from the Kerguelen Region at various depths; Radiolaria observed in the deposit and at the surface at *Challenger* station No. 157, in lat. 53° 55′ S.; Diatomaceæ observed in the Kerguelen Region; surface organisms. To each of these lists are appended extracts from the reports of zoological specialists bearing on questions of distribution, and at the end of each is a series of classified lists, which affords means of estimating the probabilities in restricted cases, such as the occurrence of certain species beyond specified limits of area or depth.

Dr. Murray then proceeds to examine the general conclusions as to the distribution of marine life formulated in the concluding volume of the *Challenger* Reports, in the light of the detailed information furnished by the lists. The denial of the old belief in a universal fauna of great age in the deep waters receives full support; and there is further marked confirmation of the result that the marine fauna of high southern latitudes markedly resembles that of high northern latitudes—is, indeed, much more closely related to it than to the fauna of any intermediate region. A further remarkable fact is, moreover, clearly brought out—that in the Kerguelen Region eight hauls with dredge and trawl at depths of two miles yielded 30 more species of Metazoa than are known to exist within 50 fathoms of the surface. The comparative poverty in species of the surface waters in the higher southern latitudes is confirmed by observations in other sections of the Great Southern Ocean. The ratio of species to genera in the shallow waters round Kerguelen (down to 150 fathoms) is 1·74 to 1, little more than half the general average of 3 to 1, and in marked contrast to what occurs in the tropics, as, for example, in the neighbourhood of Cape York. Dr. Murray gives an extremely interesting discussion of this fact, pointing out the great preponderance of animals secreting large quantities of carbonate of lime in the shallow waters of the tropics, and showing how the difference can be explained as a result of chemical rather than of physiological conditions.

Recurring to the remarkable similarity of the fauna of the two extra-tropical regions, Dr. Murray states at length the hypothesis that the distribution of marine life began at the level of the mud-line somewhere about the middle or end of Mesozoic times, when the conditions of uniform climate all over the world came to an end through the gradual shrinkage of the sun's diameter, and consequent unequal heating of the atmosphere. A considerable amount of evidence is brought forward in support of an extremely beautiful theory, to which there

seems to be no *à priori* objection; a theory upon which it would be out of place to offer any detailed criticism until the mathematical physicist decides that its life is to be spared.

NOTE TO SKETCH-MAP OF THE UPPER KUYUNI, BRITISH GUIANA.*

By Lieut. GODFREY-FAUSSETT, R E.

[THE following note from Lieut. Godfrey-Faussett, dated "St. Lucia, W.I., April 2, 1896," will explain the sketch-map of the upper Kuyuni river, published in the present number of the *Journal*.]

"I have the honour to enclose herewith a sketch of the upper waters of the Kuyuni river, British Guiana, from the point (Akarabisi) where it begins to be the present boundary between British Guiana and Venezuela to a few miles above Yuruan. The traverse was taken by me with a prismatic compass last January, when sent up the Kuyuni by the British Guiana Government to Yuruan. The traverse was corrected by observations of latitude and longitude taken some time previously by Mr. McTurk, the magistrate of the district, and a surveyor by profession. It will be seen that the course of the river varies very considerably from the Government map, especially above Ekereku."

THE USE OF BALLOONS IN GEOGRAPHICAL WORK.

By A. BERSON.

AT the meeting of the Berlin Gesellschaft für Erdkunde on January 7, Herr A. Berson read a paper on "Geography and Ballooning." The use of captive balloons for obtaining extensive views over unexplored regions becomes greatly restricted in marshy districts, on account of the difficulty of carrying the heavy cylinders of compressed gas, used for inflating the balloons; but wherever river transport in vessels of any size is available, as in the basin of the Congo or Amazon, the question assumes a very different phase. A small captive balloon of about 8800 cubic feet can raise a car containing one or two persons, and enable them, from a height of say 1600 feet, to survey many square miles of country. Still, even in the tropics the loss of gas from a properly made balloon is small, at least during the dry season, and the number of gas cylinders taken need not be large. On board ship, especially in the polar regions, such balloons may be even more serviceable, and it is greatly to be regretted that Nansen was at the last moment prevented from carrying out his intention of adding them to his equipment.

The employment of free balloons for purposes of this kind can only be seriously thought of when the prevailing winds are sufficiently constant to afford a reasonable prospect of landing in a region where provisions and stores can be obtained, or where the expedition can be brought to a satisfactory conclusion. The author, from his experience in thirty-eight ascents at all times and in all weathers, is of opinion that the expedition arranged by Andrée and his companions has little chance of success, and, indeed, is the most risky venture ever undertaken by explorers. He

* Map, p. 576.

agrees with a large number of meteorologists in believing that there is no definite proof of climatic conditions being favourable. We know but little about the winds prevailing between Spitzbergen and the pole, and of the region between the pole and 70° N. latitude—a stretch of about 1350 miles—we know absolutely nothing, either in the direction of Eastern Siberia or North-Western America. It is further obvious that the atmospheric circulation in the belt of moving depressions round the pole cannot be favourable to a journey of from 2000 to 2500 miles. As to the still greater difficulties of practical ballooning, which come first in any question of possible success, the author has found journeys of 180 to 300 miles, with balloons up to 160,000 cubic feet, enormously difficult during rain or snow, and below the rain-cloud level it is impossible to maintain a straight course for longer time. Crossing even a narrow arm of the sea is always difficult; the celebrated French aëronauts L'Hoste and Mangot, after crossing the English Channel several times at its narrowest part, perished in an attempt to reach England from the mouth of the Seine, near Quillebeuf, on a perfectly clear day. The distance direct is only about 80 miles, and in the direction of the prevailing winds, towards Weymouth, 125 miles, but they were never heard of again, although in the most frequented waters in the whole world. In the present state of practical ballooning, Andrée's polar expedition is little better than wilful suicide.

Special departments of geographical science may benefit indirectly by the use of balloons. We can scarcely imagine, for example, a more stimulating and instructive lesson for the student of geo-morphology than a bird's-eye view of a large tract of country, in which he can study at leisure the form and structure of river systems, mountain masses, or depressed areas.

The contributions made to our knowledge of the physics of the atmosphere by the recent balloon ascents at Berlin are of interest to the geographer as well as the meteorologist. Fifty ascents were made in free balloons, and twenty-five in captive balloons, with the primary object of revising and extending the results obtained by James Glaisher thirty years ago. The work developed itself along three lines, corresponding to the chief directions of progress since Glaisher's time. Meteorology has since then been raised to the position of a physical science by the introduction of the synoptic method; the recognition of the fundamental importance of ascending and descending currents has transformed its leading problems into questions of the dynamics of the atmosphere; and last, but not least, improved instrumental methods, founded on truer principles, have seriously modified the results of observation. Geographers and cosmographers are, however, chiefly interested in two atmospheric agencies of the first rank—the motion of the air and its temperature.

The numerous ascents in which observers took part—five over 19,500 feet, one over 26,000 feet, and one over 29,500 feet, the greatest elevation yet attained—have added greatly to our material. We have shown conclusively that the progressive decrease in the rate of fall of temperature with increased height, and consequent approximation to a uniform moderately high temperature at the upper limits of the atmosphere, which was deduced by Glaisher, must be ascribed to defective observation, and chiefly to the faulty protection of the thermometers from the greatly increased solar radiation. Under all conditions and at all seasons, it was found that at high elevations the rate of fall was not only as great, if not greater, than at intermediate levels, but even, for the most part, at the lower levels; and in the open atmosphere, at elevations of about 26,000 feet, much lower temperatures were met with than had been supposed possible since Glaisher's time. At 25,600 feet readings of 35° to 36° Fahr. below zero were recorded, against Glaisher's 4° Fahr. below zero; and at 30,000 feet 54½° Fahr. below zero; giving an average rate of decrease of 0·49° Fahr. per 100 feet, compared with Glaisher's 0·10° Fahr. These

figures agree with the results of experiments recently made in France with balloons carrying self-registering instruments, which gave 90° Fahr. and 101° Fahr. below zero at 49,000 and 59,000 feet respectively; and we are led to surmise that the temperature near the upper limits of the atmosphere must approach much nearer to the absolute zero than has been hitherto believed, the rate of fall in the higher layers answering the so-called adiabatic conditions, which require it to be 1° Fahr. in 182 feet.

Another important result obtained, again contrary to that deduced from Glaisher's defective observations, was that at a height of 16,000 to 20,000 feet the temperature of the air is but little affected by seasonal or diurnal variations, or even by changes in the conditions of weather and cloud; while at 26,000 it is, to a great extent, independent of all these influences. We need only mention, in passing, the proofs of the occurrence of excess of temperature in the middle layers between 5000 or 6000 and 13,000 feet, and of a regular inversion of the temperature gradient in winter and at night, extending to 3500 or even 6000 feet; there is more geographical interest in the information received from the journeys of the "Humboldt" and "Phœnix" as to atmospheric currents. It has come out, in the first place, that the known increase of wind velocity with height is more general and greater in amount than was supposed; and, further, that the frequent exceptions to the occurrence of this phenomenon are apparently limited to layers between 5000 and 10,000 feet, a mixing of currents often taking place at 10,000 to 12,000 feet, although at still greater heights the normal increase is resumed. This increase was at times extraordinarily great, as, for example, in a clear, almost calm September day, when, at a height of 3000 to 10,000 feet, the wind velocity was scarcely 6½ miles an hour; between 13,000 and 20,000 feet it was over 35 miles an hour. The little pilot balloon "Cirrus," which reached a height of between 50,000 and 60,000 feet, covered the distance from Berlin to Jazyny, between Wilna and Minsk, about 560 miles, in six and three-quarter hours, or at an average rate of 84 miles an hour.

The preponderance of westerly winds at high levels, already known from observations of the movements of cirrus clouds, was confirmed; and the deflection to the right, required by theory, was also established, for the pilot balloons showed a course from west to east or north-west to south-east much more frequently than from south-west to north-east, the direction of the prevailing winds at the surface. It was, at the same time, very evident that the amount of the deflection, the height at which it began, and the whole manner in which it took place depended largely on the position of the pilot balloon with reference to the general distribution of pressure. Near an area of high pressure, the wind, blowing gently out of the anticyclone at the surface, increased somewhat in strength, but at an average height of 3000 to 8000 feet it died away altogether, and above that a current from a nearly opposite direction was suddenly entered, which increased in force only slowly until a height of 13,000 feet was reached, and blew towards the centre of the barometric maximum. The inverted exchange of air between cyclones and anticyclones at high levels belongs to this class of phenomena; the inflowing current is already apparent at 6500 feet, and is sharply divided from the outflowing current under it. Within areas of low pressure, on the contrary, after the comparatively rapid variations of the first few hundred feet, the regular deflection in the wind direction comes in only very gradually, and even at great heights the air is still flowing parallel to the isobars or but slightly towards the higher pressures, hence the return current to the anticyclone must apparently, in this case, ascend to much greater elevations. These observations seem to show that the detached anticyclones which disturb the general atmospheric circulation of these latitudes extend to a

much smaller height above the Earth's surface than the vortices of our cyclones, which are, in a certain sense, only secondary offshoots from the great sub-polar depression.

THE MONTHLY RECORD.

THE SOCIETY.

The Society's Educational Prizes.—The following candidates for Queen's scholarships, under the Education Department, were successful at the December examination in obtaining the prizes for proficiency in geography offered by the Society. MALES.—*Prizes of £2 each:* Edgar G. Carder, Richard R. Dobson, Fred. Farrar, Robert J. Finch, Stanley R. Hewitson, John S. James, Thomas M. Jeffreys, James Morrison, John P. Mullineux, John Russell, James W. Stokoe, Claude E. Warner. *Certificates:* George A. Barrett, Sherwin Chase, William Chick, George Clark, William A. Cooke, John W. Dean, Charles Frith, William C. Goodson, William G. Hawker, Ernest E. James, William D. Lloyd, Sydney Manion, Walter H. Nickson, Frederick W. Pratt, James H. Sedgwick, William Sedgwick, Douglas V. Sidaway. FEMALES.—*Prizes of £2 each:* Amy E. Adams, Alice E. Chapman, Susannah Chirgwin, Florence G. Clark, Margaret A. Hunter, Florence Prescott, Rhoda E. Smith, Eleanor E. Smye. *Certificates:* Lilian M. Cooke, Jessie Harding, Bertha Ward.

EUROPE.

High-level Meteorological Station in the Balkan Peninsula.—The meteorological service organized in the Austro-Hungarian dependencies in 1891, which at the end of 1894 had already seventy-seven stations in operation, including three of the first order and six of the second, has received an important addition by the opening of a high-level observatory on the Bjelašnica, a chief peak on the dividing range between Sarajevo and Mostar. The position of the observatory is in lat. 43° 42′ N., long. 18° 15′ E., elevation 6780 feet. This is the first high-level station in the Balkan peninsula, and as it is situated on a "true peak," it may be expected to yield results of extreme interest. From the first year's work, a summary of which is to be found in the February number of the *Meteorologische Zeitschrift*, it appears that one of the chief difficulties to be met is the immense deposit of ice-crystals on the instruments, similar to that experienced on Ben Nevis and on the Brocken. The observatory is in telephonic communication with Sarajevo, 5350 feet below.

The Ship Canal at the Iron Gates.—According to information received from Buda-Pest, the waters of the Danube were admitted to the ship canal at the Iron Gates on March 1. The canal, of which some account has already been given in the *Journal* (vol. i. 1893, p. 243), is cut through the dyke crossing the bed of the river, on the southern or Servian side. Its length is about 2 miles, width 260 feet, and depth 10 feet. The Danube is accordingly henceforth navigable for the largest river steamers, even at its lowest, from Vienna to the Black Sea. The formal opening of the canal for traffic is fixed for September 27, and the ceremonial is to form part of the Hungarian commemoration festival.

The Protection of the Hallig Islands.—The Prussian Government has resolved to begin works for the protection of some of these islands, which act as

excellent breakwaters to the west coast of Schleswig, and the smaller of which are liable to be entirely swept away by violent storms. Dykes, stakes, and bushwork are to be thrown round Oland, Gröde, and Appeland, and Oland (south-east of Föhr) is to be connected by an embankment on the one hand with the mainland, and on the other hand with Langeness. The works are expected to cost £66,000, and to be completed within five years (*Petermann's Mitteilungen*, 1896, part ii.).

ASIA.

The Mouths of the Siberian Rivers—Explorations in 1895.—The work of the Siberian hydrographic expedition, under Colonel Vilkitzki and Lieut. Ivanoff, during the past summer, as appears from a paper just published in the Russian *Official Messenger*, was most successful. The steamer *Lieut. Ovtsyn*, with its sailing barge, *Lieut. Skuratoff*, wintered at Yeniseisk. Coal, for the summer's navigation, had been supplied during the winter in two places: at Troitsk, near Krasnoyarsk, where it was of inferior quality (160 tons, at 42*s.* 9*d.* the ton), and at Dudinka, on the lower Yenisei, where it proved excellent and quite equal to imported English coal, and where, owing to special conditions, the Samoyedes were willing to transport it, so that 350 tons could be prepared (at 40*s.* the ton). On June 25 the expedition left Yeniseisk, accompanied by the steamer *Minusinsk*, under Mr. Wiggins, junior. They explored the not yet surveyed parts of the lower Yenisei, and then steamed towards Cape Mate Sala, which was still surrounded by ice. Passing round the north-east extremity of the Yalmal peninsula, the steamer, with its barge, entered Ob bay, surveyed its eastern shores, which proved to have been previously very imperfectly mapped, and on September 12 they reached Obdorsk, which has now eight hundred inhabitants, and is rapidly becoming the centre of the whole region. Entering next the Irtysh, they went to Tobolsk, where the steamer was left to winter, as it is proposed to resume next year the exploration of the Ob. The explorers came to the following important conclusions:—The difference between high water and low water in the Yenisei, which attains nearly 3 fathoms at Yeniseisk, goes on decreasing in its lower course, and ceases to be felt in the Brekhovskiye archipelago. The same is true of the rapidity of the current, which attains 5 knots in the narrow upper parts of the river, but decreases in its lower course to three-quarters of a knot, while at the flow of the tide it falls to a quarter of a knot only. In its lower parts, the bed of the river is sufficiently broad to be navigated as far as Turukhansk, *i.e.* for 670 miles, without a pilot. With a pilot, ships having a draught of from 20 to 21 feet can navigate as far as the rapids (1000 miles from the mouth); while in the spring a 4 fathoms' depth is found all the way, nearly up to Yeniseisk. It appears, moreover, that there are no sudden changes in the depth of the estuary of the Yenisei, and that the shoals are all situated along the shores, which are now well mapped—the detailed surveys being based upon accurate astronomical determinations. The eastern entrance to the estuary, on the east of Sibiryakoff's island, has been found safe and easy in all sorts of weather. As to the western entrance, in the west of the same island, its depths also render it safe; but, owing to the high seas running during southern winds, and the fact that shoals spread north of the island, and that they must be passed close by, this passage can be utilized by entering ships only in quite clear weather, while for out-going ships it affords an easy passage in nearly all sorts of weather. This passage, which is shorter than the eastern by 80 miles, has the advantage of offering an uninterrupted depth of 5 to 6 fathoms—where the polar ice does not accumulate—which permits Cape Mate Sala to be reached at a time when the eastern passage is not yet free of ice. As to Ob bay, whose eastern shore was surveyed this year in its northern portion, and the west shore in the south up to Obdorsk, it appears that it is not so wide as is shown on the maps, and that it has

not the straight direction it was supposed to have. Under 72° N. lat., the eastern coast suddenly bends to the west, and runs for 45 nautical miles westwards. Under the 71st degree it turns again eastwards, and only then runs due south, the errors of our best maps in the position of the coast attaining as much as 30 to 35 nautical miles. Moreover, the error in the position of the cape at the entrance into the Tazov bay proved to be 55 miles. This circumstance explains the loss of the steamer *Louisa* and the schooner *Moskva*, as they sought escape from storms in Tazov bay. The depth of Ob bay, if one steams in sight of the shores without approaching them, is from 6 to 12 fathoms. Sand-shoals were only met with in proximity of the western shore (on one of them the schooner *Tumen* perished in 1879); but the seas run so high that it is much more difficult to struggle against them in this bay than in the estuary of the Yenisei. During a southern storm, experienced near to Tazov bay, the *Lieut. Ovtsyn*, torn from its anchors, was so balanced that the inclination of the steamer attained over 40° on each side. The water of the bay is sweet, and, contrary to what is seen in the Yenisei, very muddy. The banks are marshy, and there is no floating timber along them. Nor is there any tree vegetation, the northern limit of the same being situated much more to the south than is the case on the Yenisei. The first bushes on the Yenisei are seen at Lukovaya, in 70° N. lat.; while in the Ob bay bushes appear only in the Khamanel Ob, under the 67th degree. No human beings were met with in the whole length of the bay, *i.e.* a length of 670 miles. The first fishers' huts and Ostyak encampment were found in the Khamanel Ob, which is covered with islands, and upon which navigation is consequently safe. Further details concerning the Ob itself may be omitted. It must be added, however, that an officer of the expedition, M. Botkin, M.D., has made very interesting natural history collections, especially of the fauna of the two bays. Nordenskjöld has, of course, explored the Siberian arctic fauna, but his dredgings were chiefly made in the salt ocean water, while the expedition chiefly dealt with a mixed fauna, and could ascertain how far the marine fauna penetrates into the two bays. The collection, now in the hands of specialists, is said to contain a considerable proportion of quite new and interesting species.

The Anglo-Afghan Frontier Agreement.—The agreement between India and Afghanistan concluded on November 12, 1893, and popularly known as the "Durand Agreement," has been published in the recent Chitral Blue Book. It consists of seven clauses, most of which are purely geographical. Clause 1 provides that the eastern and southern frontier of his Highness's dominions from Wakhan to the Persian border shall follow the line shown in the map attached to the agreement. Clause 2 provides against interference by either government in the territories beyond the line. Clause 3 provides for the retention by the Amir of Asmar and the valley above it as far as Chanak. His Highness agrees not to interfere "in Swat, Bajaur, or Chitral, including the Arnawai or Bashgal valley." Birmal is ceded to the Amir, who gives up, on the other hand, the rest of the Waziri country and Dawar, as well as Chageh. Clause 4 directs the demarcation of the frontier wherever practicable and desirable by joint British and Afghan commissioners, "whose object will be to arrive by mutual understanding at a boundary which shall adhere with the greatest possible exactness to the line shown in the map attached to this agreement, having due regard to the existing local rights of villages adjoining the frontier." Clause 5 records that the Amir withdraws his objection to the new British cantonment of Chaman. It also provides in detail for the tracing of the frontier line near Chaman. Clause 6 is of a general character, and Clause 7 permits the Amir to purchase and import munitions of war, with the additional stipulation that the Government of India will give him some help in this respect, and it also increases the Amir's subsidy

from twelve to eighteen lakhs of rupees. The above agreement has, however, been revised, and the revision will be laid on the table of the House of Commons. On April 16, Lord George Hamilton, in reply to Sir Charles Dilke, explained that though the Durand treaty provided for the whole of the Arnawi-Bashgal valley remaining in the British sphere, yet, when the delimitation began in the field, "it was found that the Bashgal and Arnawai ran in different directions, the Arnawai draining into the Kunar from the east, and the Bashgal from the west. The frontier was therefore revised, and the revision placed within the sphere of influence of the Amir the Bashgal valley, which is west of the Kunar river, and over which the Mahtars of Chitral have claimed rights. This included part of the country visited by Sir G. Robertson in 1890 and 1891." It will be apparent, on a close examination of the case, that Lord George Hamilton's statement, assuming it to be correctly reported, is not clear; in fact, it seems based on inaccurate topography. The Arnawai valley cannot, in the light of all our published information, be said to "drain into the Kunar from the east." No doubt some modifications in its course may have been revealed by the operations of the demarcation surveyors, but Mr. McNair and Colonel Woodthorpe's information shows clearly that the Arnawai valley lies west, and not east, of the Kunar river. We understand that the government are in possession of no actual survey of the Bashgal valley, and that the information as to its being distinct from the Arnawai was derived from the Amir. The point of the cession of these valleys is of political importance, as it was through the Bashgal valley that one of the Amir's armies recently invaded Kafiristan, and in the future it will form the principal access to the country from the British side.

The Afghan Campaign against the Kafirs.—A correspondent writes to us: "The letter from Miss L. Hamilton, M.D., in the *Times* of April 4, giving particulars of the Afghan campaign in Kafiristan, is exceedingly interesting, but, owing to the absence of any good map of the country, it is difficult to identify the names of the places. The best map I have yet seen is that prepared to illustrate Colonel Tanner's paper in the *Proceedings of the R.G.S.* for May, 1881. The discovery of the actual memorial tablet of stone erected by Timur in 1398 A.D., with the inscription commemorating his victory over the Kafirs in that year as narrated by Abu-l-Fazl, is a most remarkable and gratifying link with past history. The facts of Timur's invasion are given at p. 135 of Major Raverty's 'Notes on Afghanistan,' which it would be worth while for your readers to glance at. And this brings me to a suggestion which I respectively commend to the attention of your readers and of the Royal Geographical Society. Could not a map be prepared to accompany Major Raverty's remarkable work? At present the value of this voluminous and important book, with its innumerable routes and topographical data, is seriously diminished by the absence of a good map with the names of places spelt in Major Raverty's well-known system of rigid orthographical accuracy. As in every case, I believe, the orthography is in accordance with the true written form of each word, it may be assumed that such a map would be a great help to the Indian Intelligence and Survey Departments, and perhaps the India Office might be disposed to co-operate with the Society in its production."

The Ethnography of Caucasia.—The very great variety of races and stems which have settled in the highlands of the Caucasus during the great migrations, and inhabit them up till now without mixing, is well known; and it was for a long time the ambition of ethnographers and geographers to first establish an appropriate classification of these different populations, and next to determine the numbers of each of them and their geographical distribution. The first part of this task has mainly been accomplished through the linguistic researches of the late Baron Uslar and his follower, M. Zagursky. As to the second part, the detailed

lists of the families in all the villages of Transcaucasia, which were made in 1886–91, give the necessary materials. Now, the results of these researches have been embodied by E. Kondratenko in a series of maps of the different provinces of Russian Transcaucasia (Tiflis, Kutais, Erivan, Kars, Elisabethpol, Baku, and Daghestan), on the scale of 20 versts (13 miles) to the inch, upon which all the different races and stems are represented by different colours. The maps, in the shape of a folio atlas, are given as a supplement to the eighteenth volume of the 'Memoirs (*Zapiski*) of the Caucasian Geographical Society.' Each village community having been mapped separately, and the boundaries of each village's territory being given on these maps, one sees on them at a glance the ethnical composition of the population, as well as the degree to which different populations are interwoven in each part of the territory. At the same time, on the margins of each map one finds the numerical composition of the population of each separate town, while two other coloured diagrams give the items of population of different nationalities in each of the districts (*uyezd*) into which the provinces are subdivided, and the totals for each province. The classification of the different nationalities of Transcaucasia being the fruit of very careful linguistic investigations, it is well to notice it in this place. The Indo-European or Aryan family is, of course, represented by the Slavonians, Germans, Romans, Pelasgians (Greeks), Iranians (Ossetes, Persians, Tates, Talyshins, and Kurds), Armenians, and Hindus (Tsiganes). The Semitic family includes the Jews and the Aisores. Next come the Caucasians proper, divided into several groups: the Kartvelian group, that is, the Georgians proper, with their numerous sub-branches—Tushins, Pshaves, Khevzurs, Mtiuletians, Imeretians, Gurians, Ajars, Enghilois, Mingrelians, Lazes, and Svanetians. The mountaineers (*Gortsy*) are divided into two groups: the western mountaineers (Abkhazians, Cherkesses, and others), and the eastern mountaineers (Chechens). Next comes a great subdivision, including the Lezghians, which comprises the following groups: the Avaro-Andian group, the Darghi, the Kyurin, and the Udin groups, as well as a group of smaller stems (nearly ninety-seven thousand souls), whose affinities with the Lezghians are not yet fully established. All these belong, of course, to the White race, but Transcaucasia has also among its inhabitants the Yellow race, in which the Caucasian ethnologists include the Turkish stem: the Akzerbijan Tatars, the Turks proper, the Turomanes, the Karapapakhes, the Nogais, and the Kumyks. Finally, the Finnish stem is represented by a few Esthonians. It must also be added that the same volume of the Caucasian memoirs contains a map which completes the above atlas and acquires a special interest at present; namely, a map of Turkish Armenia and Kurdistan, based on V. Cuinet's work, 'La Turquie d'Asie, en 1890–94,' upon which map the percentage of Armenians to the total population of each sub-district (*kaza*) is given in different colours. It is striking to see on this map how extremely small is the territory where the Armenians make more than fifty per cent. of the aggregate population. Only two *kazas* in the north-east and the south-west of Lake Van, out of 148 *kazas* in the eight *vilayets*, are in this case; while even on the west of the lake, where the Armenians are relatively more numerous, they make only from twenty-five to forty-five of the population. With the exception of these two *kazas*, and three others in which the Nestorians or the Greeks prevail, nearly the whole of the map is coloured in dark green (seventy-five per cent. or more of Musulmans), or in light green in the south-east (fifty to seventy-five per cent. of Musulmans). Two papers, in which all numerical data are given in full, accompany these really excellent maps.

A Journey from Damascus to Bagdad.—The third number of *Petermann's Mitteilungen*, 1896, gives the first part of an account of a journey made by Freiherr

v. Oppenheim in the summer of 1893 from Damascus to Bagdad. Beginning with a wide loop through the volcanic region to the south and south-east of Damascus, in the course of which he was able to follow a route not hitherto traversed by any European, namely, that through the middle portion of the Harra, or stony desert, to the east and south-east of the volcanic hills of Jebel Hauran and Jebel-es-Safa. Wetzstein, Graham, the Comte de Vogüé and M. Waddington, and Herr von Stübel had none of them got farther south than the Wadi el Gharz (between Jebel-es-Safa and Jebel Hauran), and Captain (afterwards Sir Richard) Burton and Mr. Drake had been stopped on the southern margin of the former hills. The Harra is composed of sheets of lava that has issued at different times from volcanoes, or flowed out of rifts in the ground without any marked rise of the surface in the neighbourhood. The different sheets can easily be distinguished by their difference of colour or the different degrees of disintegration. The lava is now for the most part broken up into dark brown or black blocks of 30 to 40 cubic yards in size, being only seldom met with in larger compact masses. The undulations of the ground over which the sheets were originally poured can still be seen in the surface of the lava. Between the Harra and the Jebel-es-Safa is a lava-free plain, called the Ruhbe, about 6 miles long by 3 to 3½ miles wide, which in the rainy season becomes almost marshy and yields excellent grain, but in summer is only a bare steppe. In the new part of his route, which began at Salkhad, on the south-east of Jebel Hauran, proceeding thence in a north-easterly direction, Baron von Oppenheim passed through Sali, a town on the east side of Jebel Hauran, once evidently of great importance, in which he discovered some very remarkable ruins—quadrangular towers with chambers narrowing towards the interior, their side walls forming the radii of a circle. Like the Sardinian nurhags, these towers have their outer walls built of large and well-hewn stones in the lower courses, smaller and more roughly cut stones higher up. He then visited Nemara, in Roman times a military post situated on the Harra to the south of the Ruhbe and the Jebel-es-Safa, and thence proceeded north-north-east through the Ruhbe to Jebel Ses, climbing the Jebel-es-Safa on the way. Jebel Ses is the rim of a crater, the interior of which is now occupied by a plain about half a mile in diameter. It looks down on a small plain on the east free from stones, and in winter mostly converted into a lake or swamp. Here fragments of walls and tolerably well-preserved ruins of other kinds bear witness to the former existence of a considerable population in this neighbourhood. There are numerous Sabæan inscriptions, and in Roman times troops were stationed here. Von Oppenheim's southerly loop ended at Dumer, a large village on the edge of the plain of Damascus, whence a route somewhat south of the regular caravan route was followed to Palmyra (Tadmor), now the seat of a mudir. From Palmyra he crossed the so-called Syrian desert by the caravan route to Der (Deir or Ed Deir), on the Euphrates, in five days. Though water is found only at three places on this part of the route, the term "desert" does not properly designate this part of the Syrian Hamad. It should rather be called a steppe, having in spring a rich growth of grass where there is enough water, and being permanently sterile only where the gypsum and limestone, which form the basis of the plain, come to the surface. Within the last few decades Der has been a rapidly rising town, though von Oppenheim considers Cuinet's estimate of the population, twenty thousand, somewhat too high. Its prosperity is due to the establishment of the zaptieh barracks (kishlas) at intervals of a day's journey along the direct route to Aleppo, by means of which that route has been rendered perfectly secure. At a time when we are hearing so much of Turkish misgovernment, it is a change to read of the excellent results of Turkish administration in one part of the empire. Von Oppenheim admits that the last part of the route to Bagdad, that in

Mesopotamia, is still somewhat unsafe, but persistent efforts are being made by the mutessarif of Der to keep the wild Beduin in subjection. Efforts to induce them to settle down to agriculture on the banks of the Tigris and Euphrates have been to a large extent successful. A remarkably beneficent institution is the Ashiret Mektebi, a school at Constantinople for the education of the sons of influential sheikhs from all parts of Turkey, but especially the Beduin districts, founded under the direct initiative of the Sultan Abdul Hamid II., "whose eye is directed to all the possibilities of progress in his wide empire."

M. Chaffanjon's Journey in Mongolia and Manchuria.—The *Comptes Rendus* of the Paris Society (1896, Nos. 1 and 2) contain some details as to M. Chaffanjon's journey, the fuller account of which is given in reports addressed by him to the Ministry of Public Instruction. He had arrived at Irkhutsk in December, 1895, by way of Cnuguchak, Kobdo, and Urga, having thus traversed Western Mongolia from south-west to north-east. His chief difficulties had been encountered in the passage of the Altai, where the only routes consist of bridle-paths used by horses or sheep. The few caravans of camels which enter the mountains proceed very slowly, and make immense détours to avoid the summits of the chains. M. Chaffanjon was planning to continue his journey during the present year across Manchuria to Vladivostok by way of the Kerulei-Kuriulun, Dalai-Nor, and the Khinghan mountains, afterwards visiting the lower Amur and the Pacific coasts for the purpose of collecting specimens of the flora and fauna.

AFRICA.

General Chapman on the Mapping of Africa.—In supplement to the short article in the April number of the *Journal*, it will be useful to quote the following recommendations made by General Chapman, in connection with Mr. Templer Horne's communication: "It will be observed that, for the completion of the present system of triangulation, the co-operation of the Orange Free State will be required; whilst, in order to run the three meridian series and the traverse series of triangles along the eighteenth parallel of south latitude, it will be necessary to apply for assistance both to Germany and to the Transvaal Republic. In this necessity for the assistance of others lies the germ of that united action which it is my earnest desire to see extended over the whole continent of Africa. How this may be ultimately attained is a question which requires much consideration: but it would seem to me that the principal element of success is to be found in the formation of an International Committee. The formation of such a committee, whose members could correspond freely with each other, and meet at stated periods to report progress and exchange ideas respecting future extension, would be invaluable, and, indeed, would appear to be almost a necessity in order to secure harmonious and systematic work. It further occurs to me that, if reports something similar to that of the Surveyor-General of the Cape could be furnished by those entrusted with the survey work in the various African colonies, and if these reports could be submitted to this committee for general consideration, no inconsiderable advantage would be derived therefrom. Possibly, too, the work already done by each country might be plotted on a skeleton map of the continent. This, and the publication by the committee of an annual report, would, I think, be of undoubted value, enabling each country to take note of the progress which had been made by the others, and affording a valuable record on which to build new schemes for extending the work into the interior."

Mount Kenia.—The following communication from Mr. Hardinge, H.M. Agent and Consul-General at Zanzibar, dated "Mombasa, February 29, 1896," has been forwarded to the Society at the request of the Secretary of State for Foreign Affairs: "I have the honour to report that Dr. Kolb, a German explorer formerly

connected with the Freeland Society, has just returned here from Mount Kenia, to the summit of which he claims to have ascended. His route was from Kibwezi *viâ* Ikutha and Kitui across the upper waters of the Tana; and he describes the country as very fertile and populous, and as enjoying an excellent climate. The people inhabiting and cultivating the slopes of Kenia have no common tribal name or government, but are called after their respective districts or villages. They are distinct both from the Wakamba and Wakikuyu, but speak a dialect resembling that of the first of these tribes. He had a certain number of fights with them, but eventually succeeded in establishing fairly friendly relations with them, and in inducing one of their chief medicine men to come down to see Mombasa, so that he may tell his countrymen on his return of the wonders of the coast. Dr. Kolb was enabled to collect some interesting information as to the tributaries of the Tana, and to establish the existence of four of them hitherto, I believe, unknown, or only partially and inaccurately known, viz. (going from south to north), the Tiwa, the Nsua, the Eusui, and the Sungussa, all of which rise in the highlands of Ukambani, and flow in a mainly easterly direction through the barren country intervening between Ukambani and the Galla country to the immediate west of the Tana. This region, which commences on the other side of a chain of hills about 40 miles to the east of Kibwezi, he repeatedly visited, and he describes it as a desert inhabited only by a few Gallas; the Wakamba take nine days to traverse it. I was struck by Dr. Kolb's account of the denseness of the population in Ukambani. He reckons the Wakamba at not less than half a million, and says the German missionaries at Ikutha regard even this estimate too low."

Tripoli.—The following interesting letter, dated "Tripoli (Tarablus el Gharb), March 17, 1896," has been received from Mr. H. S. Cowper: "I have just returned from a visit to the Jafara Tarhuna and M'salata districts of the Tripoli hills. My route on leaving here coincided for the first two days with last year's trip, and I then diverged east, and entered Tarhuna by the Wadi Tergurt (or Ter'gud), running nearly parallel with Wadi Doga. In this wadi, and near its *Fum* or mouth, I found some important Jenam sites, but at one of the most remarkable I was compelled to desist from examination, owing to the very threatening attitude of the local Arabs; this was due chiefly to the existence of *Meraboots* of saints' tombs in the immediate vicinity. My route passed from Tergurt, up Wadi Guman, which joins it, and brought me out close to my camping-ground of March 24 in last year. Leaving this, I rode a day's journey south, and came to the upper part of the Wadi Tergelat, which is south of the Fergana district, and not close to Jebel Nisid of M'salata, as incorrectly placed in the map in my recent paper. The latter is Uani, or Ueni, running to Tergelat. This Tergelat is the most important wadi in the district, and is undoubtedly the ancient Cinyps, which runs to the sea 15 miles south-east of Khoms. Travellers have called it Kaam, which, however, is the district it traverses near its mouth: and others name it Nigar el Grin; but, curiously, the proper name for its whole course, *Tergelat*, has not, as far as I am aware, been noted. I was, unfortunately, unable to carry out my plan of following this important wadi down to its mouth, as my guide considered the lower parts unsafe. I therefore examined the sites in its upper course, in the districts called Ghirrah and Mamura, and then returned through Fergana and Kseia to Jebel Nisid (M'salata); and thence passing south of Kusabat, I reached Khoms. From Khoms I rode to the mouth of Tergelat at Kaam (Kam), and spent five days among the ruins of Leptis. Exclusive of Leptis, I was able to visit about thirty new sites or ruins, of which some twenty were of the Senam type, one or two showing remarkable features. I instituted inquiries in different quarters about the number and lines of the various Tarhura wadis, and the information obtained

appears considerably at variance with all existing maps I am acquainted with. Numerous compass bearings were taken; and after some difficulty I succeeded in obtaining a complete list of the Tarhuna tribes. These number about thirty-six, but it should be noted that there does not appear among them a tribe called Tarhuna, as is mentioned in some Government reports."

The Mahdist Power on the Upper Nile.—A concise summary of the principal occurrences in the Eastern Sudan since the Mahdist revolt fifteen years ago—especially those relating to the provinces held for a time by Slatin, Luptin, and Emin—is given by M. Wauters in the *Mouvement Géographique* (1896, Nos. 12 and 13). The present position and extent of the Mahdist power in those regions is shown thereby (the latter being illustrated by a map) as well as the extent of the French and Belgian occupation in the regions to the south-west. Especial attention is called in the second article to the way in which the Dinkas on the Bahr-el-Ghazal have succeeded in freeing themselves from foreign dominion, having first, with the aid of the Madhists, defeated the heroic efforts of Lupton to maintain the Egyptian rule; and then, turning against their allies, succeeded in driving them out of the Bahr-el-Ghazal province, which has thus remained in great part outside the Mahdist influence. The possession of steamers on the Nile has, however, given the Arabs the advantage in this quarter, and though, owing to the absence of Omar-Saleh, the expedition of Van Kerckhoven in 1891–92 met with no resistance on the upper Nile, the Mahdists soon took the offensive, and the Belgian posts at Dufile and other places had to be evacuated. The Congo state has now four strong fortified posts on the upper Welle, but, contrary to statements that have been made, holds none in the Lado *enclave*. The French have small garrisons at a few posts on or near the Mbomu, of which the most easterly is at Zemio's, in about 25° 20′ E. long. North of this the Mahdist influence extends southwards to the Nile-Congo watershed.

French Congo.—A useful map of the whole basin of the Sanga as at present known has been published by M. Wauters in the *Mouvement Géographique* (1896, No. 5). Care has been taken to make use of all the material available, particularly that furnished by the Brothers De Brazza, Lieut. Mizon, and MM. Clozel and Ponel, by which the work of the first explorers, MM. Cholet and Gaillard, has been supplemented. The positions of M. Mizon, published lately in the *Bulletin* of the Paris Society, to which allusion has been made elsewhere, have been largely used in fixing the geographical co-ordinates on the Sanga itself; while on the Congo, those of Captain Rouvier, with one by Captain Delporte, have supplied a fixed base to start from. That extensive gaps still remain in our knowledge even of the hydrography of these regions is shown by the fact that the course of the Licona, crossed by M. S. de Brazza in one of his first journeys in the interior of French Congo, has remained to the present day undetermined, it being still uncertain whether it joins the Likuala or enters the Congo by an independent mouth; nothing also is known of the course of the northern or "grassy" Likuala, which flows between the Sanga and the Ubangi. While the generally accepted idea is that the main branch of the Sanga is that formed by the junction of the Mambere and Kadei, both coming from the neighbourhood of Kunde, on M. Mizon's route, M. Wauters shows that the large size of the Goko, which joins the other branch from the west between 1 and 2° N. lat., makes it possible that this is the principal branch, and that it may be supplied by important streams from the north-west (including some crossed by Mizon between Kunde and Ngaundere), carrying the basin of the Sanga further in this direction than has been supposed. M. Wauters also calls attention to the fact that, according to Mizon's positions of Kunde and Gaza, the Cameroons frontier is shifted considerably to the westward,

between 4° and 6° N. lat. The map shows the results of M. Clozel's journey across the watershed into the Shari basin (*Journal*, vol. vi. p. 185), accounts of which have been published (with maps) in the *Bulletin du Com. de l'Afr. Franç.* (1895, p. 245), and in the *Tour du Monde* (1896, Nos. 1–3). After leaving the Sanga basin, Clozel first crossed a river named Bali, still belonging to the Congo basin, before reaching the Wom. This he is inclined to consider as the upper course of the "grassy" Likuala, though M. Wauters prefers to suppose that it is that of the Lobai, a tributary of the Ubangi. The space between the Sanga and Wom is mainly occupied by an extensive plateau, giving rise to various streams. The Wom rises in the group of mountains of Mande, between Kunde and Ngaundere. Where seen by M. Clozel, it had a breadth of about 70 yards, with a depth of 7 feet, quite free from rocks or rapids. As this was in the dry season, he considers that for six months in the year it should be navigable for light-draught steamers.

The Congo Railway.—A recent number of the *Mouvement Géographique* (1896, No. 9) reproduces the most important sections of the report on the Congo railway, issued by the commission appointed by the Belgian Government to examine into the state of the undertaking. The general conclusions of the commissioners are favourable, both as regards the condition of the line already opened, the organization of the traffic, and the progress being made with the portion under construction. It is considered that the present service of trains would suffice for an annual traffic of 30,000 tons. The prolongation of the line to Stanley Pool will not present more difficulties than the section before Palaballa, and there is good reason to suppose that the cost of construction per kilomètre, in which a great reduction has been gradually effected, will not in future exceed 130,000 francs. The line ought to be completed, it is thought, by the end of 1900. In the first number of the *Mouvement* for the present year, M. Jules Cornet, the geologist who accompanied the commission, has given some notes on the features of the country around Kimpesse, to which the works for the railway have now advanced, 160 kilomètres (100 miles) from its commencement. Shortly before this the railway will cross the Kwilu—here 27 yards wide, and flowing between banks 16 to 20 feet high—by a tubular bridge 90 yards long. The river apparently rises at least 10 feet in the rains. Beyond this the line reaches the plain watered by the Lukunga and its affluents, north of which rises the steep escarpment of the rugged plateau known as the *Bungu*, which recalls that of Kundelungu in Katanga.

Captain Bòttego's Expedition.—News of Captain Bòttego's expedition is published in the *Bollettino* of the Italian Geographical Society, 1896, p. 97. It had arrived at Lugh in good condition on November 18, and friendly relations had been established with the natives, although they were found, on arrival, to have retired to the opposite (right) bank of the Ganane. Captain Bòttego was to start for the interior about December 10 or 12.

CENTRAL AND SOUTH AMERICA.

Projected Ship Canals in the United States.—Dr. Emil Deckert gives an account in *Petermann's Mitteilungen*, 1896, No. ii., of four ship-canals, the construction of which is now being advocated in the United States on commercial or strategical grounds, or both. The first of these, the Cape Cod canal, has been in contemplation for many years, but the company which now has the work in hand seems likely to proceed with it more energetically than previous projectors. The route likely to be adopted is only about 7½ miles in length, beginning at the town of Barnstable, which lies on a small sheltered bay in the south of Cape Cod bay, and ending at the Bass river, south-east of Barnstable. It would be without locks, and would be comparatively easy to construct, the only serious difficulties being the removal of the bar at the mouth of Barnstable bay, and the deepening of the

Bass river entrance. As the canal would reduce the distance between New York and Boston from 400 to 250 miles (37 per cent.), and the sea traffic between New York and New England ports amounts to more than twelve million tons annually, it is expected that the canal would prove remunerative. Another project is for the construction of a canal between Raritan bay and the Delaware, which would reduce the distance between New York and Philadelphia by sixty-six per cent.—from 274 to 92 miles. The canal would begin near Sayreville (above South Amboy), on the Raritan river, and, following the depression between the Cretaceo-Tertiary hill country of south-eastern New Jersey and the Triassic-Archæan-Palæozoic highlands in the north-west of that state, would join the Delaware at Bordentown, below Trenton. The depression referred to is nowhere more than 100 feet above sea-level, and is mainly filled with beds of sand, gravel, clay, and marl; but near both ends of the canal three locks would be required, with a rise of 20 feet each. The length of the canal would be 25 miles, and the proposed depth is, for the present, only 20 feet. A third project is for the construction of a Delaware-Chesapeake canal through the root of the Delaware peninsula, below Wilmington. The construction of a canal without locks at this part, where the width is only 13½ miles, would present no serious difficulty, and would reduce the sea distance between Philadelphia and Baltimore from 430 to 112 miles, or by seventy-four per cent. The fourth project is for a Chesapeake-Albemarle canal. This would have a length of about 14 miles, and would be quite as easy to construct as the last-mentioned; but, as it would reduce the distance between Baltimore and Beaufort (N.C.) by only 11·6 per cent. (from 430 to 380 miles), its chief advantage would lie in the avoidance of the dangers of Cape Hatteras.

AUSTRALASIA AND POLYNESIA.

Geological Explorations in the Northern Territory of South Australia.—A report by Mr. H. Y. L. Brown, Government geologist for South Australia, has been issued, describing geological explorations made by him in the northern territory in 1894. The routes followed led from Port Darwin in a variety of directions, both along the coasts and into the interior, and the country examined included the banks of the Victoria and Daly rivers (of the former of which several photographic views are given); the gold districts; the vicinity of the telegraph route as far as Alice springs; and a section between Powell's creek telegraph station and Buchanan creek near the Queensland border. A general knowledge of the geological formations was obtained, and the important discovery was made of rocks belonging to the Carboniferous and Cretaceous series, not previously proved to exist in the country. The Carboniferous rocks are on the coast, and may prove to contain workable seams of coal, and thus be of great importance in the development of the territory. Auriferous rocks were also discovered at the mouth of the Fitzmaurice river. The claims in the gold districts are almost all worked by Chinese, mostly in an unsystematic manner, and the report urges the need of the sinking of deep shafts, with drives and cross-cuts, to prove whether the surface reefs and veins are continued downwards. In the detailed description of the various routes, useful information is given of the general surface features, as well as of the geological structure of the country. This is especially the case in the section dealing with the tableland country between the telegraph line and the Queensland border, which consists chiefly of open plains, with patches of low timber, well grassed throughout. The country had suffered from a prolonged drought, but during the time embraced by the journey a considerable amount of rain fell, making much of the surface extremely boggy and difficult. Blue-bush and gutta-percha trees grow on land liable to floods, which cover large areas in the rains. The record of rainfall kept by Mr. Hutton, manager of the Brunette Downs cattle station,

showed the following results for January and February: January, 15·830 in.: rainy days, fourteen. February, 9·640 in.: rainy days, thirteen. Geological sketch-maps of the various routes are appended to the report.

POLAR REGIONS.

Dr. Nansen's North Pole Expedition.—A Reuter despatch from St. Petersburg states that a telegram received there from Irkutsk says, "M. Skripitzyn, governor of Yakutsk, has communicated to the governor of Irkutsk for publication the following report sent by M. Kazantseff, assistant chief of police, from Ust Yansk, dated March 21: 'The inhabitants of Ust Yansk know nothing with regard to the fate of Dr. Nansen's expedition. The natives who stayed from May to November last year on the islands of Liakhoff and Kotelny, where the stores of provisions organized by order of Baron Toll are deposited, did not see any ship or traces of wreckage in the adjacent seas. M. Kuchnareff (the trader) was not questioned on the subject, as he was away on business a distance of over 1000 versts from Ust Yansk. Persons who know him state that he based his letter on Dr. Nansen's expedition on old newspaper reports.'" Another telegram, dated "St. Petersburg, April 21," is as follows: "M. Kuchnareff, the trader, while passing through Tomsk, is reported to have given to the local gazette the following explanation of the recent reports regarding Dr. Nansen: One of the three parties organized by M. Kuchnareff to search for mammoth ivory in the New Siberian islands returned and reported that they had seen Europeans in the neighbourhood of the islands. No attention was paid to these people, as it was thought that they were engaged on a futile and useless expedition similar to that of the *Jeannette* and others. M. Kandakoff, the police official at Kolymsk, through whom the reports were received, concluded that the Europeans mentioned belonged to Dr. Nansen's expedition. The two other parties of ivory-collectors are expected to return to the Continent in November, and they should be able to give more positive information regarding the Europeans in question."

Expedition to Spitzbergen.—Early in June Sir Martin Conway will sail either from Bergen or Tromsö, in company with Mr. A. Trevor-Battye, Mr. B. V. Darbishire, and a geologist (Dr. J. W. Gregory), for Ice Fiord, Spitzbergen. The object of the expedition is to explore the interior of the west island, which is almost wholly unknown. In 1890 Mr. G. Nordenskjold, with two companions, landed in Horn sound and crossed the inland ice to Recherche bay in three days; and in 1892 M. Charles Rabot landed in Sassen bay, walked up the Rendal, and climbed Mount Milne-Edwards, likewise in three days. With these exceptions, no travellers have visited any part of the interior of West Spitzbergen. Sir M. Conway and his party intend to spend three months on the island.

The Arctic Ocean (Barents Sea).—At a recent meeting of the Russian Geographical Society, Lieut. Zhdanko reported on the hydrographic researches made in this part of the Arctic Ocean during the years 1893-95. One of the chief objects was to obtain more accurate maps of the magnetic elements. Declination was determined accordingly in eighty-seven different spots along the Murman (Norman) coast and in the White Sea, and, with the aid of the secular variation deduced from General Tillo's latest maps, a general map of the region was drawn. It appears that there are but few anomalies in the distribution of declination, except in the neighbourhoods of Teriberki, where it is only 1·5°, and in the Kola bay, where it attains 32° (*?*). The importance of a magnetic map for these regions—where the fogs often prevent astronomical determinations—will be fully appreciated by navigators. As to the measurements of temperature and

density of water, which have been made at 732 different spots, they have given the necessary materials for constructing isothermal maps of the surface temperature of water for the months of July and August for three consecutive years. It appears, from the three years' averages map, that a warm current 33 miles wide, and having a temperature of from 9° to 11° Centigrade, flows along the Murman coast. As it progresses north-east its temperature decreases, but so slowly that even on reaching Novaya Zemlya it has, at the entrance of the Matochkin Shar, a temperature of 3°. In the south-east of the Barents Sea, between the islands Kolguev and Vaigach, there is a cold zone, having a surface temperature of 0°, and even less, evidently dependent on the inflow of cold water from the Kara Sea. The breadth and extension of the warm zone vary from year to year. In 1893, which was an especially warm year, a current having a surface temperature of 5° reached the coast of Novaya Zemlya and the mouth of the Pechora; while next year (1894), which was distinguished by especially unfavourable conditions owing to the prevalence of north-east winds at the beginning of the summer, the surface temperature in July was only 3° where it had been 5° in 1893, and no temperatures of 5° were found to the east of Kolguev island, the ice covering the sea within 35 miles from the island. The ice disappeared, however, and yielded before the warm current in August. Measurements of the density of water have also been made, but not in sufficient numbers. It appears, however, that, the water of the warm branch of the Gulf Stream being characterized by a density of 1·025 and more, and by its blue colour, it would be possible to settle the limits of the warm current by means of mere density observations.

Honour to an Arctic Seaman.—Mr. John R. Radmore was gazetted to the rank of Chief Carpenter in H.M. Fleet on April 13, 1896. Mr. Radmore was one of the ten men, forming the crew of Admiral Markham's sledge, who reached the latitude of 83° 20′ 26″ N. on May 12, 1876. He fought manfully against the scurvy, and was one of the four who were able to drag the sledge alongside the ship on June 14.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Mean Atmospheric Temperature in the Southern Hemisphere.—At a recent meeting of the Austrian Meteorological Society, Professor Hann read a paper giving a comparison of the results of different and independent methods of calculating the average temperature of the air, at intervals of 10° of latitude, in the southern hemisphere. The first column of the table given below is derived from the formulæ based on the work of Zenker (*Geo. Journ.*, 1893, p. 541), the second from a treatment of actual observations by purely statistical methods, and the third from a formula developed by Hann (see his *Klimatologie*, 1883, p. 91). The close agreements of the results is very remarkable.

Latitude S.	Zenker's calculations. Fahr.	Observations. Fahr.	Hann's calculations. Fahr.
°	°	°	°
0 (Singapore)	79·0	78·8	78·8
10 (Torres Strait, British New Guinea) ...	77·5	77·7	77·9
20 (Mauritius)	72·9	73·4	73·0
30 (Natal)	65·5	65·1	64·6
40 (Bass Strait, Melbourne)	56·1	53·6	54·1
50 (Falkland Islands)	44·8	42·1	42·6
60	32·5	32·2	31·6
65 (Northern Islands of Antarctic Regions)	—	26·6	26·8
70 (North coast of Victoria Land) ...	22·6	—	22·6
80	17·2	—	16·0
South Pole	16·3	—	14·7

Only in 40° and 50° lat. do the differences exceed a few tenths of a degree. The means for 65° S. lat. in the second column are obtained from the observations of Ross and Borchgrevink. Hann is of opinion that up to 65° lat. the results he gives are substantially true mean values, and they characterize the southern as essentially the *water* hemisphere. Nearer the pole observation may yield very different results, on account of the Antarctic continent; it is to be hoped that it will soon be possible to settle this question. Hann's later work gives a mean temperature of 58·6° Fahr. for the whole southern hemisphere, slightly lower than his former value (59·7° Fahr.), and also slightly lower than the value (59·0° Fahr.) obtained for the northern hemisphere. The mean temperature for the whole of the Earth's surface is 59·0° Fahr.

GENERAL.

Monument to Captain Coquilhat.—The *Bulletin* of the Antwerp Geographical Society (1895-96, No. 3) contains the account of the inauguration in June of last year of the monument erected by the city of Antwerp in memory of Captain Coquilhat, who died at Boma in 1891. Captain Coquilhat was one of the Belgian officers who did most in the early days of the Congo State to establish its authority in the interior, and, after two separate periods of service in Africa, returned in 1890 as vice-governor of the state. His health had, however, suffered severely from the climate, and he fell a victim to dysentery in March, 1891. He had published in 1888, under the title 'Sur le Haut Congo,' an interesting work containing his notes and recollections of life in Africa. The monument consists of a bronze group, designed by the Comte de Lalaing, representing Africa, as symbolized by a negress, encircling a medallion of the young officer with palm-branches.

CORRESPONDENCE.

Makran.

In the April number of the *Journal* (p. 388), Colonel Holdich, in his paper on Makran, adopts the popular etymology of that name, viz. Mahi ("fish") and Khuran ("to eat"), on no other ground, apparently, than that the population of that coast still lives (as no doubt it has always done) on fish, and that "the derivation is too appropriate to be parted with without a struggle." Nevertheless the struggle must be endured. The word has no connection with the supposed derivation, but is a Dravidian name, which appears as Makara in the Brhat Sanhita of Varaha Mihira, in a list of the tribes contiguous to India on the west. It is also the Μακαρήνη of Stephen of Byzantium, and the Makuran of Tabari and Moses of Chorene. Even were it not a Dravidian name, in no old Aryan dialect could it signify "fish-eaters." No etymology, in fact, is so perilous as that which is merely appropriate. If Arrian had not called the people of Makran ἰχθυοφάγοι, no one would probably ever have thought of this popular but erroneous derivation.

GEORGE N. CURZON.

Theoretical Geography.

Cambridge, Mass., March 16, 1896.

In the March *Journal*, pp. 318–319, Mr. Abbe's paper is described "as a purely theoretical discussion, not based on actual observations." This does not seem to me to place the coast survey maps in their proper light. When Dr. Hann, for example, makes his studies of the observations on the Sonnblick, is his discussion a purely theoretical one? He does not make observations; fortunately, his ability is not wasted in that way: he uses actual observations, however, and in an admirable manner. I do not propose to compare Abbe, jun., and Hann, but their method of

work seems to me very similar. Each one takes the results of the careful observations of trained observers, and discusses them. Each is based on *actual* observations, if not on *personal* observations. Abbe's work does not seem to me to be purely theoretical; nor would it be redeemed from that bad class, if it had belonged there, by his visiting the capes that he described. He studied authentic records of the facts; advanced theories to account for them; considered the consequences of the theories; compared the consequences with the facts; and attempted to evaluate his results. This is not purely theoretical, but completely logical and scientific. Whether he did this scientific work well or badly, is another matter; but I regret to see it condemned as "purely theoretical, not based on actual observations." My reason for this is, in part, that I have come, from personal experience, to have a high estimate of the possibilities of scientific study of geography, through good maps, in the manner of Abbe's work. Practically, all these results * that I have published on the English and French rivers were gained at home, from maps, and only confirmed by study on the ground. The maps are as much records of facts as if they were numerical tables or verbal records. Take Leverrier's case; would his discovery of Neptune be described in the words you have applied to Abbe's work, "Not based on actual observations"?

A further reason for my regretting the condemnatory implication of your notice is that it appears to place a higher value on the ordinary phase of observation without theory, than upon what you here characterize as theory without observation. Truly, observation with theory is best: but as between going to the capes and seeing them simply with my own eyes, without using any maps, and staying at home with the advantage of the wonderfully minute and accurate maps, I should, without hesitation, choose the latter.

W. M. Davis.

OBITUARY.

The Rev. Horace Waller.

The Rev. Horace Waller, who died at East Liss on February 22, had been a Fellow of the Society for thirty-two years. On all occasions on which questions relating to those parts of Africa with which he had been more personally connected arose for discussion he was a regular attender of the meetings, always advocating the claims of the people of the country, and pressing for the development of the natural resources of our African protectorate.

Born in London in 1833, and educated under Dr. Wadham at Brook Green, Mr. Waller, after leaving school, entered into business in the city. In 1860 he went out as lay member attached to the mission sent by the Universities under Mackenzie, the first Bishop of Central Africa. Arriving off the mouth of the Zambezi in 1861, the bishop and his party were, after visiting the Comoro islands and the Rovuma in company with Dr. Livingstone in H.M.S. *Pioneer*, escorted by way of the river Shire to the Nyasa highlands, where a mission was established in a district which since then has become a centre of coffee-planting. The geography and resources of that country were then little known, the district having been visited for the first time only a few years previously by Dr. Livingstone and the members of the Government Exploring Expedition. At the time of Mr. Waller's arrival, the Shire highlands were devastated by slave-hunting tribes, who sold their captives for the supply of labour at Zanzibar, Madagascar,

* Perhaps you would class these also as "purely theoretical—not based on actual observations."

and elsewhere. While then attached as lay member to the Universities Mission, more than the ordinary share of exposure and hard work fell to Mr. Waller; he travelled much in the country, and several times he passed along the rivers Shire and Zambezi, thus gaining an accurate knowledge of the people and the country. On the withdrawal of the mission from the highlands, Mr. Waller returned in 1864 to England, and, after taking Holy Orders, became eventually rector of the parish of Twywell, where he remained for twenty-two years, retiring to Hampshire only a few months before his death.

Mr. Waller's chief literary work is undoubtedly the account given by him from diaries and notes of the last journeys of Dr. Livingstone, in the preparation of which he displayed, along with marked affection for his friend great tact and skill. He was a constant contributor on all questions connected with the slave trade, and a keen advocate of British claims to territory in East Africa; in this way he did much to bring about the British protectorate over Nyasaland, which promises to become one of the most prosperous of our African possessions.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1895-1896.

Afternoon Technical Meeting, Monday, March 16, 1896.—CLEMENTS R. MARKHAM, ESQ., C.B., F.R.S., President, in the Chair.

THE Paper read was:—

"On the Maps used by Herodotus." By John L. Myres, M.A.

Ninth Ordinary Meeting, March 23, 1896.—CLEMENTS R. MARKHAM, ESQ., C.B., F.R.S., President, in the Chair.

ELECTIONS.—*Frederick George Afolo; F. J. Albrecht; Alexander Rowland Alston; Sir Arthur Birch, K.C.M.G.; W. Browne; Timothens Henry Burd; John Dawson; Walter Phelps Dodge; A. Spencer Ellam; Harry Harvey; Wm. O. Stenteford; Captain Cecil Claude Walter Troughton (4th Batt. Prince of Wales' N. Staffs.); Hugh Watt.*

The PRESIDENT said: I heard this afternoon of the death of one who is well known amongst us—Lady Burton. She was the supporter and adviser of one of the greatest of our geographers, Sir Richard Burton, a household word amongst us for now nearly half a century, and during, I think, thirty years of that time Lady Burton was constantly heard of as helping and supporting him in all his work. She was a good geographer for his sake. She has lived a very retired life at Mortlake latterly, and it is now more than a year since I heard from her. She then spoke of the consolation she found in the memory of former days, and, with her usual enthusiasm, of the wonderful gifts of him she had lost. Sir Richard Burton was not always fortunate, was not always lucky, but he deserved success. He made some enemies, although he was the most agreeable man I think I ever met, and in all his good points Lady Burton followed him. He certainly was fortunate in having secured so incomparable a wife. I cannot refrain from offering this brief tribute to the memory of a distinguished woman before proceeding to the business of the evening.

The Paper read was:—

"The Waterways of English Lakeland." By John E. Marr, F.R.S.

Tenth Ordinary Meeting, April 13, 1896.—CLEMENTS R. MARKHAM, ESQ., C.B., President, in the Chair.

ELECTIONS.—*John Ainsworth; A. W. Andrews; Joseph Bradshaw, J.P.; Russell Day; Bignell George Elliott; William Griffith; T. T. Gilkison; Professor Angelo Heilprin; Syad Mohammed Lalef. Khan Bahadur; Lieut.-Colonel E. P. Maltby (Indian Army); John Linton Myres, M.A.; Major Hugh Wodehouse Pearse (East Surrey Regiment); The Lord Stanmore; John Neville Oldfield Thurston; John A. Wauchope.*

The Paper read was :—

"Popocatapetl, and the Volcanoes of the Valley of Mexico." By O. H. Howarth.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., *Librarian*, R.G.S.

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full :—

A. = Academy, Academie, Akademie.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce, Commercial.
C. R. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
J. = Journal.
M. = Mitteilungen.
Mag. = Magazine.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue, Revista.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.

On account of the ambiguity of the words *octavo, quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

EUROPE.

Austria—Cherso. *Abrégé B.S. Hongroise G.* **23** (1895). 50–55. **Czink.**

Cherso. Isola nel Quarnero. Luigi Prof. Czink.

Azores.

Archivo dos Açores. Publicação periodica destinada á vulgarisação dos elementos indispensaveis para todos os ramos da Historia Açoriana. Vols. i.–xii. [Nos 1–72.] Ponta Delgada, 1878–1894. Size 9 × 6½. *Presented by Sr. Ernesto do Canto.*

Europe in the Glacial Period. *Ymer* **15** (1895): 40–54. **Nathorst.**

Frågan om istidens växtlighet i mellersta Europa. Af A. G. Nathorst. *With Map.*

On the maximum extension of the European ice-sheet.

France—Gascogne. *B.S.G. Com. Bordeaux* **19** (1896): 98–109. **Duffart.**

Les anciennes baies de la côte de Gascogne, de la Gironde à l'Adour. Par Ch. Duffart.

Germany—Hamburg. **Melhop.**

Historische Topographie der Freien und Hansestadt Hamburg von 1880 bis 1895 (nebst vielen Nachträgen aus älterer Zeit) im Anschluss an die "Historische Topographie," von C. J. Gaedechens unter Benutzung amtlicher Quellen verfasst von W. Melhop. Hamburg: W. Manke Söhne, 1895. Size 9½ × 6½, pp. xii. and 656.

Case of 7 maps accompanying. Size 15 × 9½. *Price (Text and Maps)* 21*s.*

The maps include a complete plan of Hamburg on the scale of 1 : 10,000.

Germany—People. *Globus* **69** (1896): 106–109. **Kossinna.**

Die geschichtliche Entwicklung der germanischen Volksgrenzen in Ost und West. Von Dr. Gustaf Kossinna.

An address delivered to the Philological Society of Berlin on Jacob Grimm's birthday.

Hungary—Arad. *Abrégé B.S. Hongroise G.* **23** (1895): 56–69. **Jankó.**

Land und Leute des Comitates Arad in der neueren Zeit. Dr. Johann Jankó.

A summary of the section of the great monograph on the Royal free town of Arad by Alexander Marki, dealing with its history from the time of the Turkish conquest until the present day.

Hungary—Carpathians. ———

Magyarországi Kárpátegyesület. Jahrbuch des Ungarischen Karpathen-Vereines. XXII. Jahrgang, 1895. Deutsche Ausgabe. Igló: J. Schmidt, 1895. Size 9 × 6, pp. 136 and 16. *Panorama.*

Particulars of the constitution and transactions of the Hungarian Carpathian Club, with a panorama of the Hohe Tatra from the north.

Hungary—Roads. *Abrégé B.S. Hongroise G.* **23** (1895): 37–45. **Fest.**

Le vie di comunicazione dell' Ungheria coll' Adriatico. Prof. Alfredo Fest.

On the roads from Hungary to the Adriatic.

Hungary—Transylvania. *Abrégé Hongroise B G.S.* **23** (1895): 46–50. **Czirbusz.**

Das Jara-Thal und seine Bewohner. Prof. Dr. Géza Czirbusz.

Iceland. *G. Tidskrift* **13**, 1895–96 (1896): 99–122. **Thoroddsen.**

Fra det nordostlige Island. Rejseberetning fra Sommeren 1895 af Dr. Phil. Th. Thoroddsen. *With Map.*

Italy—Agro-Romana. *Cosmos* (2) **12** (1895): 65–82. **d'Ossat.**

Storia fisica dell' Agro Romano, dell Dott. Gioacchino de Angelis d'Ossat. *With Section.*

A full account of the geography of a district based on its physical features, and terminating with the utilization of its natural resources

Spitzbergen. **Hamy.**

Les Français au Spitzberg au XVII siècle. Par M. E.-T. Hamy. (Extrait du *Bulletin de géographie historique et descriptive*.) Paris: Imp. Nationale, 1895. Size 10 × 6½, pp. 28 *Maps.*

Sweden in Maps. *Ymer* **12** (1892): 81–98. **Byström.**

Sverige i utländska Kartverk. Af H. Byström.

Includes an estimate of the value of a number of atlases published in various parts of Europe, by considering the accuracy of the information shown on their maps of Sweden.

Sweden—Valleys. *Ymer* **15** (1895): 195–210. **Högbom.**

Om några genombrottsdalar i vart lands sydliga fjalltrakter. Af A. G. Högbom. *With Diagrams.*

United Kingdom—England—Mersey. **Richards.**

Report on the Present State of the Navigation of the River Mersey (1895), to the Right Honourable the Commissioners for the Conservancy of the Mersey. By Admiral Sir G. H. Richards, K.C.B., etc. With Appendix. London: Eyre and Spottiswoode, 1896. Size 10 × 6½, pp. 22. *Presented by the Mersey Commissioners.*

United Kingdom—England—Mersey. **Sweny.**

P. Literary and Philosoph. S. Liverpool **49** (1895): 87–103.

Historical Sketch of the Sea Approaches to the Mersey. By Lieutenant Mark Sweny. *With Charts.*

This will be specially noticed.

United Kingdom—Ireland. *J.S. Arts* **44** (1896): 387–391. **Haddon.**

Peasant Life and Industries in Ireland. By Prof. A. C. Haddon.

United Kingdom—Scotland—Sutherland. **Cadell.**

The Geology and Scenery of Sutherland. By Henry M. Cadell of Grange. Second Edition. Edinburgh: D. Douglas, 1896. Size 7½ × 5, pp. 198. *Maps and Illustrations.*

This will be specially noticed.

United Kingdom—Scottish Place-Names. **Don.**

Archæological Notes on Early Scotland, relating more particularly to the Stracathro District of Strathmore in Angus; also some Account of Local Antiquities and Place-Names, with Map, Plan, and Appendix By William Gerard Don, M.D. Brechin: D. H. Edwards, 1896. Size 8 × 5½, pp. 98 and x. *Map and Plan. Presented by the Author.*

Dr. Don had occasion, in the compilation of his interesting archæological notes on the east of Scotland, to investigate many of the place-names, and the result of his researches in that direction has been to throw much light on the origin of these names, the true meaning of which had been obscured by careless copyists.

ASIA.

Central Asia. **Obrucheff.**

Verh. Russ.-K. Mineralogischen Ges. St. Petersburg (2) **33** (1895): 229–272.

Ueber die Verwitterungs- und Deflationsprocesse in Central-Asien. Von Bergingenieur W. Obrutschew. [In Russian.] *With Plates.*

Central Asia. **Younghusband.**

The Heart of a Continent: a Narrative of Travels in Manchuria, across the Gobi Desert, through the Himalayas, the Pamirs, and Chitral, 1884–1894. By Captain Frank E. Younghusband. London: John Murray, 1896. Size 9½ × 6½, pp. xviii. and 410. *Maps and Illustrations. Price* 21*s. Presented by the Publisher.*

This splendid book will be separately noticed. It gives a connected account of all the journeys in Asia which won for the author the gold medal of the R.G.S., and the reputation of being one of the most competent observers and interesting recorders who ever left this country.

Ceylon. *Deutsche Rundschau G.* **18** (1896): 145–159, 208–218, 250–260. **Radde.**

Eine Woche in Ceylon. Von Director Dr. Gustav Radde in Tiflis. *With Illustrations.*

Ceylon—Sigiriya. *J. Ceylon Branch R. Asiatic S.*, 1895, **14** (1896): 44–58. **Bell.**

Interim Report on the Operations of the Archæological Survey at Sigiriya in 1895. By H. C. P. Bell, Archæological Commissioner. *With Plans.*

The rock, on the summit of which, after destroying the vegetation, the excavations were made, had to be rendered accessible by iron ladders, and protected by railings and fences, before the work here described could be undertaken.

China -Yangtze. *B.S. Neuchateloise G.* **8** (1895): 75–79. **Mechnikoff.**

Que signifie le nom de Yangtze? Par feu Léon Metchnikoff.

Suggests that the name Yangtse-kiang = Blue river, is not due to the colour of the water, but used in contrast to the Yellow river in the sense of the superiority of the former, the antithesis being between the celestial and the terrestrial rivers.

Dutch East Indies. **Van der Chijs.**

Nederlandsch-Indisch Plakaatboek, 1602–1811. Door Mr. J. A. van der Chijs. Veertiende Deel. 1804–1808. Batavia, 1895. Size 9 × 5½, pp. 908. *Presented by the Batavian Society of Arts and Sciences.*

Dutch East Indies **Van der Chijs.**

Dagh-Register gehouden int Casteel Batavia vant passerende daer ter plaetse als over geheel Nederlandts-India. Anno 1666-1667. Uitgegeven door het Bataviaasch Genootschap van Kunsten en Wetenschappen. Van Mr J. A. van der Chijs. Batavia, 1895. Size 11 × 7½, pp. 430. *Presented by the Batavian Society of Arts and Sciences.*

India and the Far East—Tobacco Industry. *J.S. Arts* **44** (1896): 367–387. **Tripp.**

The Tobacco Industry of India and the Far East. By C. Tripp. *With Map and Illustrations.*

India—Census.

Census of India, 1891 Vol. XXIII. His Highness the Nizam's Dominions. Report on the Census Operations. Parts i.–iii. By Mirza Mehdy Khan (Bombay, 1893–94). *Maps and Diagrams.* Vol. XXIV. Baroda. Parts i. and ii. By Jamshedji Ardeshir Dalal (Bombay, 1894). *Map and Diagrams.* Vol. XXV. (Four parts). Mysore. By V. N. Narasimmiyengar (Bangalore, 1893–94). *Maps, Plates, and Diagrams.* Size 13½ × 8½. Supplement to the Mysore Census Report of 1891, being a List of Villages in the Mysore Province, and comparing the Populations as per Census s of 1891, 1881, and 1871 (Bangalore, 1895). Size 14 × 8½. Vol. XXVIII. The Kashmir State. . . . By Rai Bahadur Pandit Bhag Ram (Lahore, 1893) Size 14½ × 10½. *Presented by the Secretary of State for India.*

India—Punjab.
Report on the Administration of the Punjab and its Dependencies for 1894-95. Lahore, 1896. Size 13½ × 8½, pp. xii., 220, and clxxvi. *Map and Diagram. Presented by the Secretary of State for India.*

India—Santals. *Ymer* **12** (1892): 153-186 **Heuman.**
Om Santalfolket och dess nuvarande hemland. Af Ernst Heuman.

Indian Geology. **Hudleston.**
Notes on Indian Geology, including a visit to Kashmir. By Wilfrid H. Hudleston. With an Appendix by Lieut.-General C. A. McMahon. [Reprinted from the *Proceedings* of the Geologists' Association, vol. xiv. pt. 6, February, 1896.] Size 8½ × 5½, pp. [40]. *Map and Sections. Presented by the Author.*

Japan. **Tanaka.**
IX. u. X. Jahresb. (1890 *u.* 1891) *Württemberg. Ver. Handelsg.* (1892): 132-155.
Geschichtliche Betrachtungen über den geistigen Verkehr Japans mit dem Auslande. Von Dr. Shohé Tanaka aus Japan.

Malay Archipelago—Celebes. *Globus* **69** (1896): 151-155, 171-174, 187-191. **Radde.**
Besuch auf Buton und Süd-Celebes. Von Dr. G. Radde.

Malay Archipelago—Moluccas. *Verh. Ges. Erdk. Berlin* **23** (1896): 102-143. **Warburg.**
Herr Dr. O. Warburg: Wer ist der Entdecker der Gewürz-Inseln (Molukken)?
This is reported in the *Journal* for April, vol. vii. p. 365.

Malay Archipelago—Sumatra—Bataks. **Hügel.**
The Land of the Bataks. By Baron Anatole von Hügel. From the *Geographical Journal* for January and February, 1896. Size 10 × 6½, pp. 16.

AFRICA.

Congo State—Railway. *Mouvement G.* **13** (1896): 103-114.
Le Chemin de Fer du Congo. Rapport de la Commission Belge d'Enquete. *With Map and Illustrations.*

Egypt—Goshen. *G. Tidskrift* **13**, 1895-96 (1896) 130-134. **Schmidt.**
Hvor laa det gamle Gosen? Af Professor, Dr. phil. Vald. Schmidt. *With Map.*

French West Africa—Dahomey. *Ymer* **15** (1895): 89-131. **Pomian.**
Dahome, land och folk. Af A. Hajdukiewicz de Pomian. *With Illustrations.*

Gazaland—Amakhosa Tribe. *B.S. Neuchateloise G.* **8** (1895): 126-155. **Jeanneret.**
Les Ma-Khoçi. Par Philippe Jeanneret. *With Illustrations.*

German East Africa. *M. Deutschen Schutzgeb.* **9** (1896): 43-48. **Kiepert.**
Begleitworte zur Karte "Neue Aufnahmen deutscher Offiziere in Ussagara, Ugogo, Uhehe und Mahenge." Von Dr. R. Kiepert.

German East Africa. *M. Deutschen Schutzgeb.* **9** (1896): 3-32
Die Ergebnisse der meteorologischen Beobachtungen an der wissenschaftlichen Kilimandjarostation Marangu. *With Illustration.*

German West Africa—Togoland. **Kling.**
IX. u. X. Jahresb. (1890 *u.* 1891) *Württemberg. Ver. Handelsg.* (1892): 89-112.
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Commercial Geography. *J. Franklin I.* **141** (1896): 81–97, 171–182. **Haupt.**

Commerce and Deep-waterways. By Prof Lewis M. Haupt. *With Illustrations.*

As an instance of the advantages of waterways, it is noted that a steamer in one trip towed barges containing over 8500 tons of coal down the Mississippi, an amount which would require a train of 285 goods cars, *i.e.* a train more than two miles long, to be transported by railway.

Commercial Geography.

Special Consular Reports. Highways of Commerce. The Ocean Lines, Railways, Canals, and other Trade Routes of Foreign Countries. Vol. xii. Issued from the Bureau of Statistics, Department of State. Washington: Government Printing Office, 1895. Size 9 × 6, pp. 764. *Maps.*

A work of considerable value geographically, describing in some detail, with maps, the ocean routes of the world, and the railway and telegraph systems of all countries outside the United States.

Commercial Geography—Amber. **Mauch.**

XI. & XII. Jahresb. (1892 *u.* 1893) *Württemberg. Ver. Handelsg.* (1894): 3–16

Der Bernstein. Von Christoph Mauch.

Commercial Geography—Cocoa. **[Cadbury.]**

Cocoa: All About It. By "Historicus." London: Low & Co., 1896. Size 8½ × 6½, pp. 100. *Illustrations. Presented by the Author.*

Contains an account of the history and cultivation of the cocoa tree, a history of the uses of cocoa, descriptions of its manufacture, etc.

Commercial Geography—Index.

Commercial. No. 9 (1895). Index to Reports of Her Majesty's Diplomatic and Consular Representatives abroad on Trade and Subjects of general interest. (With Appendix.) 1886–1895. London: Eyre & Spottiswoode, 1895. Size 10 × 6, pp. 522. *Price 2s. 2d.*

Commercial Geography—Navigation. **Blackmore and Colomb.**

[Course of Papers (No. 40).] Shipmasters' Society, London. Seventh Session. Introductory Address, by Captain E. Blackmore. The Manœuvring Powers of Steamships and the Avoidance of Collisions. By Vice-Admiral P. H. Colomb. London: Pewtress & Co., 1895. Size 8½ × 5½, pp. 56. *Diagrams.*

Commercial Geography—Routes. **Allingham.**

[Course of Papers (No. 41).] Shipmasters' Society, London. Seventh Session. Fast Passages and Best Routes. By William Allingham. London: Pewtress & Co., 1895. Size 8½ × 5½, pp. 48.

Commercial Treaties. **Hertslet.**

A Complete Collection of the Treaties and Conventions and Reciprocal Regulations at present subsisting between Great Britain and Foreign Powers: and of the Laws, Decrees, Orders in Council, etc., concerning the same; so far as they relate to Commerce and Navigation, the Slave Trade, Post-office Communications, Copyright, etc. Compiled . . . and edited by Sir Edward Hertslet, K.C.B. Vol. xix. London: Butterworth & Co., 1895. Size 9 × 6, pp. xxxii. and 1104

Educational. **Frye.**

Complete Geography. By Alex. Everett Frye. With Supplement, The New England States, by William Morris Davis. Pp. 32. Boston, U.S.A., and London: Ginn & Co., 1895. Size 12½ × 10½, pp. viii. and 184. *Maps and Illustrations. Presented by the Publishers.*

This is the most recent and perhaps the most ably illustrated of the text-atlas form of school-geography which finds favour in the United States. The pictures are extremely characteristic; those of the physical features of New England are by far the best text-book illustrations we have seen. The standpoint of the work is that of the United States citizen; the countries of the Old World are, however, inadequately handled. The maps are well designed or carefully copied, but the colour-printing is bad.

Educational.

Longmans' Geographical Series Book i. The Child's First Book of Geography. With 17 Illustrations and 52 Maps. London: Longmans, Green & Co., 1896. Size 7½ × 5, pp. viii. and 166. *Maps and Illustrations. Price* 1s. 6d. *Presented by the Publishers.*

This series of geographies—the first of which is anonymous—is intended to deal in successively fuller detail with the same range of facts. The first book is simply written and well illustrated, containing a number of excellent coloured maps, showing only general features, but showing them very clearly.

Educational.

The Geographical Association. Catalogue of Slides, March, 1896. Size 8½ × 5½, pp. 12. *Presented by the Geographical Association.*

The lantern slides named in this catalogue are sets which have been specially prepared for use in schools by members of the Association, amongst whom they are circulated.

Educational. **Dickinson.**

Geography as a School-subject. An attempt to show that Geography can be taught as a training of the mind. By B. Bentham Dickinson. Printed by request of the Geographical Association. Rugby: Printed by A. J. Lawrence, 1896. Size 8½ × 5½, pp. 32. *Presented by the Author.*

Contains general remarks and an outline of a course of instruction.

English and German Dictionary. **Flugel, Schmidt, Tanger.**

Flügel-Schmidt-Tanger.—A Dictionary of the English and German Languages for Home and School. With special reference to Dr. Felix Flügel's Universal English-

German and German-English Dictionary. Edited by Prof. Im. Schmidt. PH.D., and G. Tanger, PH.D. In two parts. First Part: English-German (pp. x. and 968). Second Part: German-English (pp. x. and 1066). London: Asher & Co., 1896. Size 11½ × 8½. *Price* 15*s*.

"Freeland" Colony. *M.G. Ges. Wien* **38** (1895): 621-631. **Schmitt.**

Das colonisations project der Freiländer und sein Ende. Von Robert Hans Schmitt.

An account, by a member of the party, of the failure of the unfortunate Austrian "Freeland" colony in British East Africa.

NEW MAPS.

By J. Coles, *Map Curator*, R.G.S.

EUROPE.

England and Wales. **Ordnance Survey.**

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MISCELLANEOUS:—**Index** to the East Riding of Yorkshire, coloured in parishes, showing 6-inch sheets only, price 6*d*. **Indexes** to Anglesey, Rutland, and Warwick, coloured in parishes, showing 25-inch sheets only, price 6*d*. each.

(*E. Stanford, Agent.*)

Russia—Caucasus. **Kondratenko.**

Ethnographical Maps of Governments and Provinces of the Trans-Caucasus. Compiled by the Director of the Imperial Geographical Society. E. Kondratenko. Appendix to vol. xviii. Zapiski Caucasus Section, Russian Geographical Society.

ASIA.

Indian Government Surveys. **H.M. Secretary of State for India, through Indian Office.**

Indian Atlas, 4 miles to an inch. Sheets: No. 7, parts of Deri Ghazi Khan, Rajanpur, etc., additions to 1885; No. 48, districts Puttiala Umballa, Thanesur, Kurnal, and parts of Sirmur Hurriana, Paniput (Punjab), district Dehra, and parts of districts Suharunpur, Bijnur, and Mazufurnugur (N.W. Provinces), with additions to 1893; No. 79, parts of districts Tanjore, Trichinopoly, Salem Coimbatore, Madura, and

South Arcot (Madras Presidency), Pondicherry, and Karikal (French territory) additions to 1894; No. 108, part of Vizagapatam, additions to 1894; No. 109, part of Vizagapatam, additions to 1895. Quarter-sheets: No. 60 N.E., parts of districts Bangalore, Kolar, and Tumkur (Mysore), 1895; No. 67 S.E., parts of districts Bareilly, Pilibhit, and Shahjahanpur (N.W. Provinces), and Kheri (Oudh), additions to 1895; No. 69 S.E., parts of Panna, Ajaigarh, Charkhari, and Chhatarpur (Native States Bundelkhand Agency), and of districts Hamirpur, Futtehpur, and Banda (N.W. Provinces), additions to 1892; No. 105 N.E., parts of districts Palamau, Lohardaga, and Singhbhum, and of Jashpur State (Chota Nagpur), Bengal, additions to 1895.—Bengal Survey, 1 mile to an inch. Sheets: No. 269 (preliminary edition), district Darjeeling, Seasons 1861–67 and 1881–83; Nos. 293, 294, 295, 315, 316, 317, 337, 338, 339, district Jalpaiguri (Western Duars), Seasons 1888–92.—Bombay Survey, 1 inch to a mile. No. 167 (special edition showing forests), districts Poona, Kolaba, and Satara, and Habsan and Bhor States, Seasons 1884–85; No. 176, part of district Ratnagiri, Season 1893–94.—Central India and Rajputana Survey, 1 inch to a mile. No. 431, parts of districts Damoh and Jubbulpore (Central Provinces), and of Panna Native State (Central India Agency), Seasons 1856–57, 1864–66, and 1869–70; No. 450, Parts of districts Jubbulpore and Mandla (Central Provinces), and Native State of Rewah (Central India Agency), Seasons 1860–62, 1868–69, 1873–74.—North-Western Trans-Frontier, 4 miles to an inch. No. 28 S.E., parts of districts Bannu Dera Ismail Khan, Kohat Shahpur, Jhelum (Punjab), and Mahsud Waziris, additions to 1893.—Aden Survey, 2 miles to an inch. No. 1 (2nd edit.), No. 2 (2nd edit.), No. 4 (2nd edit.), No. 5, parts of Arabia, Seasons 1891–94.—Skeleton Map of the Punjab and surrounding countries, 1874, 1 inch to 32 miles; additions to 1895.—The Provinces of Bengal, Bihar, Orissa, and Chota Nagpur, under the jurisdiction of the Lieut.-Governor of Bengal, with the Province of Assam under the Chief Commissioner, 64 miles to an inch, August, 1895.—District Rangpur, Lower Provinces Bengal, 4 miles to an inch; additions to 1894.—District Howrah, Bengal, 4 miles to an inch; additions to 1895.—Bengal, 80 miles to an inch, July, 1888.—District Amritsar, Punjab, 8 miles to an inch, 1895.—District Angul, Bengal, 8 miles to an inch, 1895.—District Damoh (Central Provinces), 8 miles to an inch, 1895.—District Manbhum, Bengal, 8 miles to an inch, 1890.—Index to the Standard Sheets of Central India and Rajputana.—Bengal, Bihar, Orissa, and Chota Nagpur, 16 miles to an inch, 1895; 2 sheets.—Chart of Triangulation, Madras Forest Survey, Tinnevelly district, 2 sheets and Table, 2 miles to an inch, Seasons 1886–92.—*Presented by H.M. Secretary of State for India, through India Office.*

AFRICA.

Abyssinia. **Istituto Cartografico Italiano.**

Schizzo del Teatro della Guerra Italo-Abissina. Scale 1: 333,000 or 5·2 stat miles to an inch. Compilato dal Tenente Guglielmi Edito dall' Istituto Cartografico Italiano. Roma, 1896. *Presented by the Istituto Cartografico Italiano.*

This map illustrates the scene of recent operations of the Italian forces in Abyssinia, and includes the country between Asmara in the north and Antalo in the south, and between the coast at Arafali on the east, and Tambuk, to the west of Aksum, on the west. An attempt has been made to indicate the relief of the country by shading, which cannot be considered altogether satisfactory, and the shading in some cases is not consistent with the difference of altitude as indicated by figures. It will, however, doubtless be a useful map of reference at the present time.

N.E. Africa. **Johnston.**

W. and A. K. Johnston's Map of Nubia and Abyssinia to illustrate Dongola Expedition, 1896. Scale 1: 2,854,868 or 45·7 stat. miles to an inch. W. and A. K. Johnston, Edinburgh and London, 1896. *Presented by the Publishers*

AUSTRALIA.

Western Australia. **Bewick, Moreing and Co.**

Map of the Western Australian Goldfields (Southern Portion) Drawn and compiled by Messrs. Bewick, Moreing & Co., mining engineers, from special surveys made by them, and from the latest information from the Mining Department of Western Australia. Scale 3·6 stat. miles to an inch. 12 sheets. *Presented by C. Algernon Moreing, Esq.*

This map includes the country between lat. 28° 15′ S. and the southern coast, and from long. 118° 25′ E. to 122° 40′ E., and thus includes the district of special interest at the present time in connection with the gold-mining developments. It

contains a great deal of information respecting the water-supply, gold leases, town sites, routes, etc., that cannot fail to be of service to those who have special interests in the district, and gives as insets a general key map of Western Australia, and a diagram showing the annual export of gold from that colony since 1887. The map is somewhat roughly lithographed, but is on a large scale, and the information it contains is clearly expressed by different colours and symbols.

Western Australia. **Calvert.**

Albert F. Calvert's Map of Western Australia, showing the goldfields. Supplement to the *West Australian Review*. Scale 1 : 6,000,000 or 94·3 stat. miles to an inch. —Albert F. Calvert's Geological Sketch Map of Coolgardie. Supplement to the *West Australian Review*. Scale 17·7 stat. miles to an inch. The Edinburgh Geographical Institute. *Presented by A. F. Calvert, Esq.*

GENERAL.

German Colonies. **Deutsche Kolonialgesellschaft.**

Kleiner Deutscher Kolonialatlas. Herausgegeben von der Deutschen Kolonialgesellschaft. Geographische Verlagshandlung Dietrich Reimer (Ernst Vohsen). Berlin, 1896. *Preis* 50 *pf.*

Maps of the German colonies throughout the World are given in this atlas. The first is a general map of the World, showing the position of the various colonies with the tracks followed by the German steamship lines. This is followed by a map of Europe and Africa, upon which the German possessions are shown. Then come (Nos. 3 and 6) maps of the German possessions in Africa, on the scale of 1 : 5,000,000, and the last is a map of the Western Pacific Ocean, showing the islands claimed by Germany.

There is explanatory letterpress to accompany each of the maps, and, taken altogether, the publishers may be congratulated on having brought out a very cheap and useful little atlas, though necessarily the maps are not produced in the most finished style.

Historical Geography. **Schrader.**

Atlas de Géographie Historique Par une Réunion de Professeurs et de Savants sons la Direction Géographique de F. Schrader, contenant en 55 feuilles doubles, 167 cartes en couleurs accompagnées d'un texte historique au dos de 115 Cartes figures et plans en noir, dans le texte, et d'un index alphabétique des noms contenus dans l'atlas. Paris : Librairie Hachette et Cie., 1896.

This important and useful atlas is now complete. The maps, which have been noticed in this *Journal* from time to time as they have appeared, are carefully executed, and the explanatory letterpress contains a vast amount of historical information that must prove of great value to the student, and interesting to the general reader.

The World. **Herrich**

Wandkarte des Weltverkehrs (Ausgabe für Oesterreich-Ungarn) Aquatorial, Massstab 1 : 22,000,000 or 5° to an inch Mit 4 Nebenkarten Central Amerika, Massstab 1 : 11,000,000. Nordsee und Kanal, Strasse von Suez und Strasse von Malakka, Massstab 1 : 4,400,000. Bearbeitet von A. Herrich Glogau : Druck und Verlag von Carl Flemming, 1896. 4 sheets. *Price unmounted.* 12 *marks.*

This is a new edition of a commercial map of the World published last year.

The World. **Spamer.**

Spamer's Grosser Hand-Atlas in 150 Kartenseiten nebst alphabetischem Orts-Register und 150 Folio-Seiten Text enthaltend eine geographisch-statistische und ethnographische Beschreibung aller Teile der Erde, bearbeitet von Dr. Alfred Hettner, a. o. Prof. an der Universität Leipzig. Mit ca 600 Karten, Plänen und Diagrammen. Verlag von Otto Spamer. Leipzig, 1896. Parts 1 and 2. *Preis* 50 *pfg. each part.*

There are at the present time so many atlases to be obtained at a moderate price, that the publisher of this might well have hesitated before bringing out another. However, this promises to be a useful work, and is certainly surprisingly cheap. As to its arrangement, it appears to be very similar to Schrader's 'Atlas de Géographie Moderne,' published by Messrs. Hachette & Cie, Paris, and some of the maps in these parts appear to be identical with those contained in that atlas, except that the names have been transliterated. Like the latter, each map is accompanied by explanatory letterpress with insets, which add considerably to its value.

Parts I. and II. contain the following maps : Part I., Südwestdeutschland ; Böhmen, Mähren, Schlesien, Ober- und Niederösterreich ; Das westliche Russland und Rumänien. Part II., Nordwestdeutschland ; Ungarn und Galizien ; Die Mittelmeerlander. Some of these are fairly well executed, but others, especially that of Bohemia, etc., are so overcrowded with names, that the physical features are, to a great extent, obliterated.

It is the intention of the publisher to complete the atlas in thirty-two parts, one of which is to appear every week or fortnight, as may be found practicable.

CHARTS.

Admiralty Charts. **Hydrographic Department, Admiralty**

Charts and Plans published by the Hydrographic Department, Admiralty, during January and February, 1896. *Presented by the Hydrographic Department, Admiralty.*

No	Inches.	
2935		Oceanic soundings, Sheet 3:—Eastern Pacific ocean. 1*s.* 6*d.*
2936		Oceanic soundings, Sheet 1:—Atlantic ocean. 1*s.* 6*d.*
2937		Oceanic soundings, Sheet 2:—Indian and Western Pacific oceans. 1*s.* 6*d.*
871 m	= 14·0	England, south coast:—Tamar river. 2*s.*
1404 m	= 12 0	Scotland, west coast:—Ardrossan harbour. 1*s.* 6*d.*
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73 m	= 12 0	Spain, north coast:—Port Pasages. 1*s.* 6*d.*
80 m	= 5·4	Spain, west coast:—Port of Ferrol. 2*s.* 6*d.*
2629 m	= 3 9	Malta island:—Part of the south coast with Filfola island. 1*s.* 6*d.*
2628 m	= 3·9	Malta island:—South-east portion. 2*s.* 6*d.*
381 m	= 4·0	Archipelago:—Mityleni anchorage and adjacent coast. 1*s.* 6*d.*
2489 m	= 0·9	North America, east coast:—Nantucket sound and eastern approaches. 2*s.* 6*d.*
1216 m	= 1·5	Africa, west coast:—Great Fish bay. 2*s.* 6*d.*
629 m	= 0·29	Africa, west coast:—Walfisch bay. 2*s.* 6*d.*
2735 m	= 0·7	China:—Si Kiang or West river, Sheet 3; Chau sun to Wu Chu fu (reproduction). 2*s.* 6*d.*
2734 m	= 0·7	China:—Si Kiang or West river, Sheet 2; Sam chau to Chau sun (reproduction). 2*s.* 6*d.*
2641 m	= 3·7	South Pacific ocean:—Guasopa harbour. 1*s.* 6*d*
2392 m	= 0·5	Solomon islands:—Vella Lavella to Wana Wana. 2*s.* 6*d.*
2659 m	= var.	Anchorages in the Solomon islands:—Jack harbour, Rice anchorage, Kolieuro inlet. 1*s.* 6*d.*
2658 m	= 6·0	Solomon islands:—Gavutu harbour. 1*s.* 6*d.*
2383 m	= var.	Anchorages in the Solomon islands:—Márovo lagoon, Mongo entrance, Charapoana entrance, Tongoro entrance, 1*s.* 6*d.*
379 m	= 0 5	Fiji islands:—Vatu Ora channel, with adjacent coasts. 2*s.* 6*d.*
2391 m	= var.	Ports in the Philippine islands:—New plans, Port San Miguel, Port Barrera.

J. D. Potter, agent.

Charts Cancelled.

No.		Cancelled by	No.
1404	Ardrossan harbour.	New Chart. Ardrossan harbour	1404
1039	Christiania harbour.	New Chart. Christiania harbour	1039
73	Port Pasages.	New Chart. Port Pasages	73
80	Ferrol harbour.	New Chart. Port of Ferrol	80
2249	Malta from Valletta to Marsa Scirocco.	New Charts. Malta, south-east portion	2628
		Malta, part of the south coast	2629
1665	Plan of Mityleni harbour on this chart.	New Chart. Mityleni anchorage and adjacent coast	381
2489	Monomoy or Old Stage harbour.	New Chart. Nantucket sound and eastern approaches	2489
617	Sherbro' river.	Large corrections to Isles do Los to Sherbro' island	601
629	Walfisch bay settlement, Walfisch bay.	New Chart. Walfisch bay	629
1806	Plan of Great Fish bay on this chart.	New Chart. Great Fish bay	1216

2734 Si-kiang or West river, Kau Kong to Chau-sun.	New Chart. Si-kiang or West river, Sam chau to Chau-sun 2734
2735 Si-kiang or West river. Kau Chau-sun to Wu-chau-fu.	New Chart. Si-kiang or West river, Chau-sun to Wu chu fu. 2735
2641 Guasap harbour (Woodlark island).	New Chart. Guasopa harbour 2641
1414 Plan of Gavutu anchorage on this coast.	New Chart. Gavutu harbour 2658
2383 Márovo lagoon.	New Chart. Anchorages in the Solomon islands . 2383
2889 Atchafalaya bay.	

Charts that have received Important Corrections.

No. A to P Index charts, 16 sheets. 1167, England and Wales, west coast:—Burry inlet. 1491, England, east coast:—Harwich harbour. 2397B, Scotland, north and east coasts. 2739, Ireland, west coast:—Tralee and Brandon bays. 1872, Netherlands:—Calais to the river Scheldt entrance. 2300, Gulf of Bothnia. Sheet 5:—Stiernö point, Fiaderäg, and Stor fiörd to Gamla Karleby. 2224, Gulf of Finland:—Helsingfors, Sveaborg, and parts adjacent. 89, Portugal:—Entrance to the river Tagus, etc. 1483, Adriatic sea:—Ports Chioggia, Malamocco, and Lido, and the channels leading to Venice. 1659, Archipelago:—Lemnos island. 2234, Sea of Azov. 2490, east coast of America:—Pemaquid point to Fletcher's neck. 2482, east coast of America:—Fletcher's neck to Cape Cod. 2580, Cuba, eastern portion. 456, Jamaica:—Port Royal and Kingston harbours. 601, Africa, west coast:—Isles do Los to Sherbro' island 1862, Africa, west coast, Sheet 17:—Lekki to river Dodo. 2776A, Africa, west coast:—River Niger, Sheet 1. 1369, Africa, west coast:—Brass river and creeks. 1920, Africa, south coast:—Table bay. 644, Africa, east coast:—Delagoa bay (Lorenzo Marques). 646, Africa, east coast:—English river, bar, and harbour. 645, Africa, east coast.—Port Melville. 648, Africa, east coast:—Delagoa bay to river Zambezi. 2089, Africa, east coast:—Tugela river to Delagoa bay. 238, Africa, east coast:—Kilifi river and approaches. 898, Bay of Bengal:—Port Monat, Port Campbell 947, Borneo island;—Victoria harbour. 967, Palawan island. 1764, China, east coast:—Amoy inner harbour. 2601, Solomon islands:—Wana Wana to Mbulo island. 2421, Pacific ocean:—Tonga or Friendly islands. 1176, Islands in South Pacific.

J. D. Potter, Agent.

PHOTOGRAPHS.

New Zealand. **Fitz Gerald.**

Sixty-six Photographs of the Southern Alps of New Zealand, taken by E. A Fitz Gerald, Esq. *Presented by E. A. Fitz Gerald, Esq.*

The geological structure, glacial phenomena, etc., of the Southern Alps of New Zealand are clearly illustrated by these excellent photographs. Mr Fitz Gerald may be congratulated on his results, especially when it is remembered that in many cases they must necessarily have been taken under trying circumstances.

Spitzbergen. **Corbett and Drummond.**

Twelve Photographs of Spitzbergen, taken during the cruise of the Training Squadron to Spitzbergen, 1895, by Mr. J. E. Corbett and Lieut. J. E. Drummond, R.N. *Presented by J. E. Corbett, Esq*

These are characteristic photographs of the Spitzbergen coast, and are well taken.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

86 87 88

38 37 36 35 34

Cherchen 4296
Remains of old Town
Sand Hills
Kichi 4869
Sandy Plain as far as could be seen
Line of Clay Mts
Ilik Bayan 8753
Munar bulak 8750
Clay hills
Chokur Pass 8976
Rugged
Broad Valley
Sarek Uchuk
High Snowy Mts
9951
10,044
15,213
Bash-molga
Isolated Hills
river runs in 6 Channels
Muzluk
10,280
Kebrutagh
11,627
Tokus Dawan
Snowy Peaks
S.P.
13,485
Kukerguk Dawan
Snowy Mts
S.P
Pat Karghalik
13,523
Broad Valley
Uluksu
Cap
14,742
High Snowy Mts
15,269
Twin Peaks
Valley sinking rapidly
15,905
Ragged Peaks
16,408
16,429
16,158
16,328
16,154
Lake
Glacier
23,339
Large
Volc.
Volc.
Volc.
Volc
17,609
Wide Gravel Plain
Tarns
16,629
Volcanic
16,518
Volcanic
Rolling hills, many tarns
15,803
Plain
15,936
Pass
17,092
Plain
16,
17,200
16,140
Valley
Valley
Broad Valley
16,097
Valley
Valley
15,759
15,378
16,686
16,290
Grassy Ice
5,600 Recent moraines
Bluff
16,241
16,729
16,624
Gravel
Barren Hills
16,868
Volc
Volc
Gravel Valley
15,982
Barren Lava Hills
Sandy Plain
16,555
17,184

Longitude East of Greenwich.

H. Sharman R.G.S. 1896.

Published by the Royal Geographical Society.

F. S. Weller F.R.G.S.

85 86 87 88 89 90 91

34 33 32 31 30

Low Ridge
3 Volcanoes over 20 000 ft
Broad Plain
Very high S.M.s
Broad Valley
Grassy Plain Numerous Tarns
Plain, some grass
Snowy Mountain
Low Hills
High Mts
Low undulating ground with occasional bluff
Broad Plain
Swamp
Broad Swamp
Glaciers
Broad Valley
Rolling hills
Nomad Camps
Grassy Plain numerous lakelets
Valley
Good grazing numerous lakelets
Valley
Grassy
Yellow Lake
Mt
ZILLING TSO (GARING TSO)
Broad Plain
Valley
Snowy Range
High S P
Round topped
Square topped
some snow
high barren hills
Rocky gorge Steep descent
Valley
Phudun Tso
Rung Tso
NAM TSO (TENGRI NOR)
NAN CHEN-TANGLA
Lharemarn
Glaciers
Valley
Lhasa
Sokam
Armah
Kokambo kang La
Steep ice-fall
Salt Pans
Shadsung Sango
Lakor Tso
Chaung Kassak
Broad Plain
PENG-CHE Lakor
BOMBA
AZUR
Chumpey
Gobrang very high vertical cliff
Tongo Volcano 4000 ft. above Camp 102
NAKCHANG
Broad Plain
High snowy Pks
Shahkanjam 25.182
Low ground as far as could be seen
High snowy ridge
Mostly bare rocky peaks
Rough country
Ridges running E & W.
Valley
Jukzung Plain
Bokseng Sango
Step cruts
Yarrah
Bokseng Sango
NEUCHU
Grassy Hills
Rough Country
Succession of ridges running E & W.
very steep
high rocky ridge
high S.P
Snowy Ridge
Rakastukar Tso
Rocky Pk
Uru
Rounded hills (rather low)
Neymo
Rocky ridge
Grassy
Thaudup
Valley
Sobung Tso
Mt
Broad Plain
Valley
Valley
Valley



ROUTE ACROSS TIBET
FROM
CHERCHEN TO TENGRI NOR AND LEH

Surveyed by St. George R. Littledale

1895.

Scale of Statute Miles. (Approx.)

0 10 20 30 40

1.: 1,000,000 or 16 Miles = 1 inch

Mr. Littledale's Route

Heights in Feet

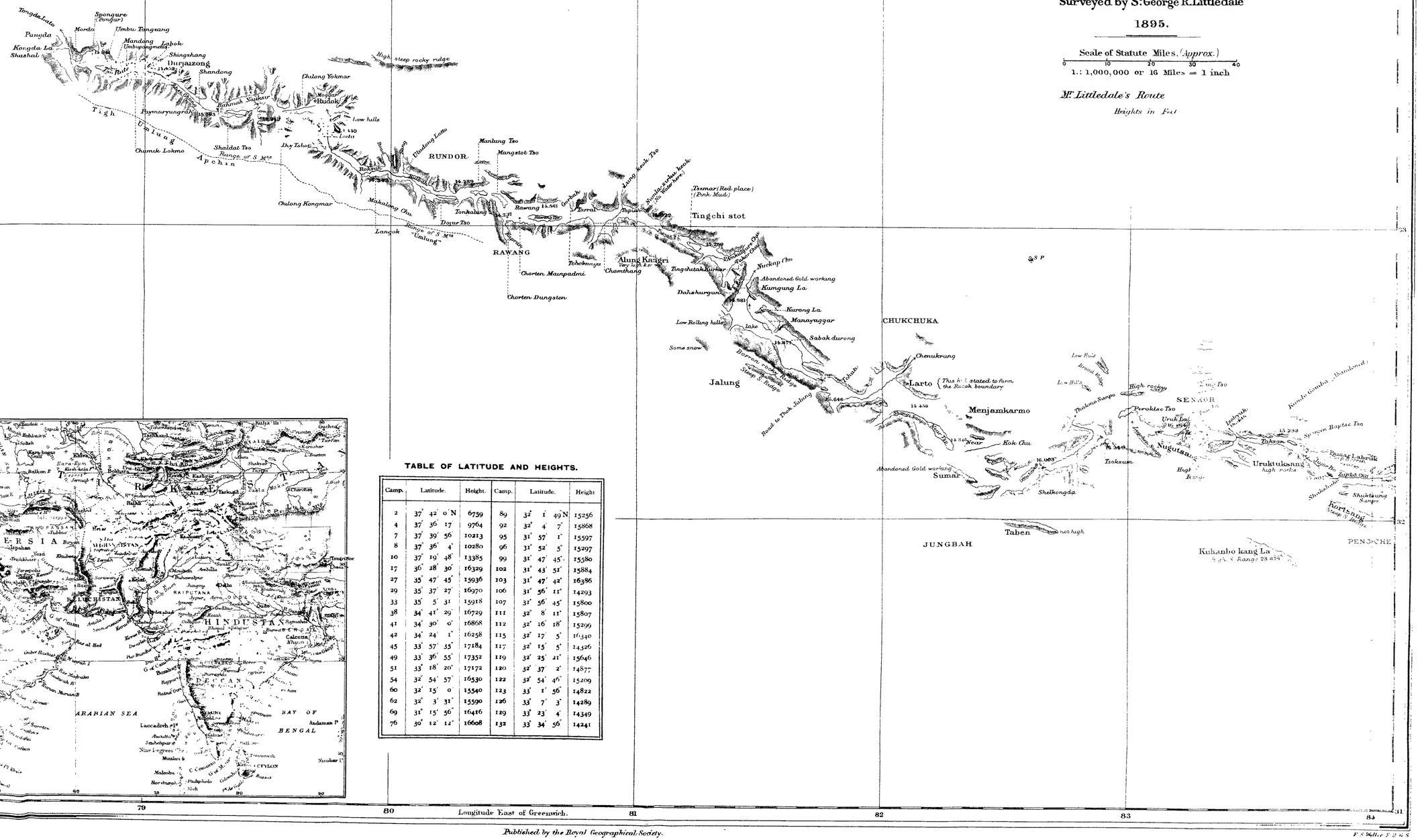


TABLE OF LATITUDE AND HEIGHTS.

Camp.	Latitude.	Height.	Camp.	Latitude.	Height
2	37° 42′ 0″ N	6759	89	32° 1′ 49″ N	15256
4	37° 36′ 17″	9764	92	32° 4′ 7″	15868
7	37° 39′ 56″	10213	95	31° 57′ 1″	15597
8	37° 36′ 4″	10280	96	31° 52′ 5″	15297
10	37° 19′ 48″	13385	99	31° 47′ 45″	15580
17	36° 28′ 30″	16329	102	31° 43′ 51″	15884
27	35° 47′ 45″	15936	103	31° 47′ 42″	16386
29	35° 37′ 27″	16970	106	31° 56′ 11″	14293
33	35° 5′ 31″	15918	107	31° 56′ 45″	15800
38	34° 41′ 29″	16729	111	32° 8′ 11″	15807
41	34° 30′ 0″	16868	112	32° 16′ 18″	15299
42	34° 24′ 1″	16258	115	32° 17′ 5″	16340
45	33° 57′ 35″	17184	117	32° 15′ 5″	14326
49	33° 36′ 55″	17352	119	32° 25′ 21″	15646
51	33° 18′ 20″	17172	120	32° 37′ 2″	14877
54	32° 54′ 57″	16530	122	32° 54′ 46″	15209
60	32° 15′ 0″	15540	123	33° 1′ 56″	14822
62	32° 3′ 31″	15590	126	33° 7′ 3″	14289
69	31° 15′ 56″	16416	129	33° 23′ 4″	14349
76	30° 12′ 12″	16608	132	33° 34′ 56″	14241

Longitude East of Greenwich.

H Sharban R.G.S. 1896

Published by the Royal Geographical Society.

E. S. Weller F.R.G.S.



A SKETCH MAP
to illustrate
THE FIRST CROSSING OF
THE SOUTHERN ALPS OF NEW ZEALAND
by E. A. FITZ GERALD

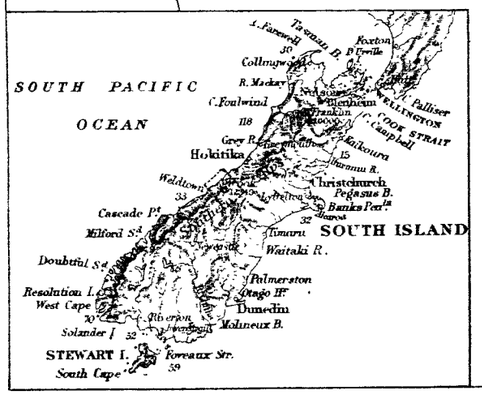
Scale of English Miles.
0 1 2 3 4 5 6 7 8 9 10

N.

SOUTH PACIFIC OCEAN

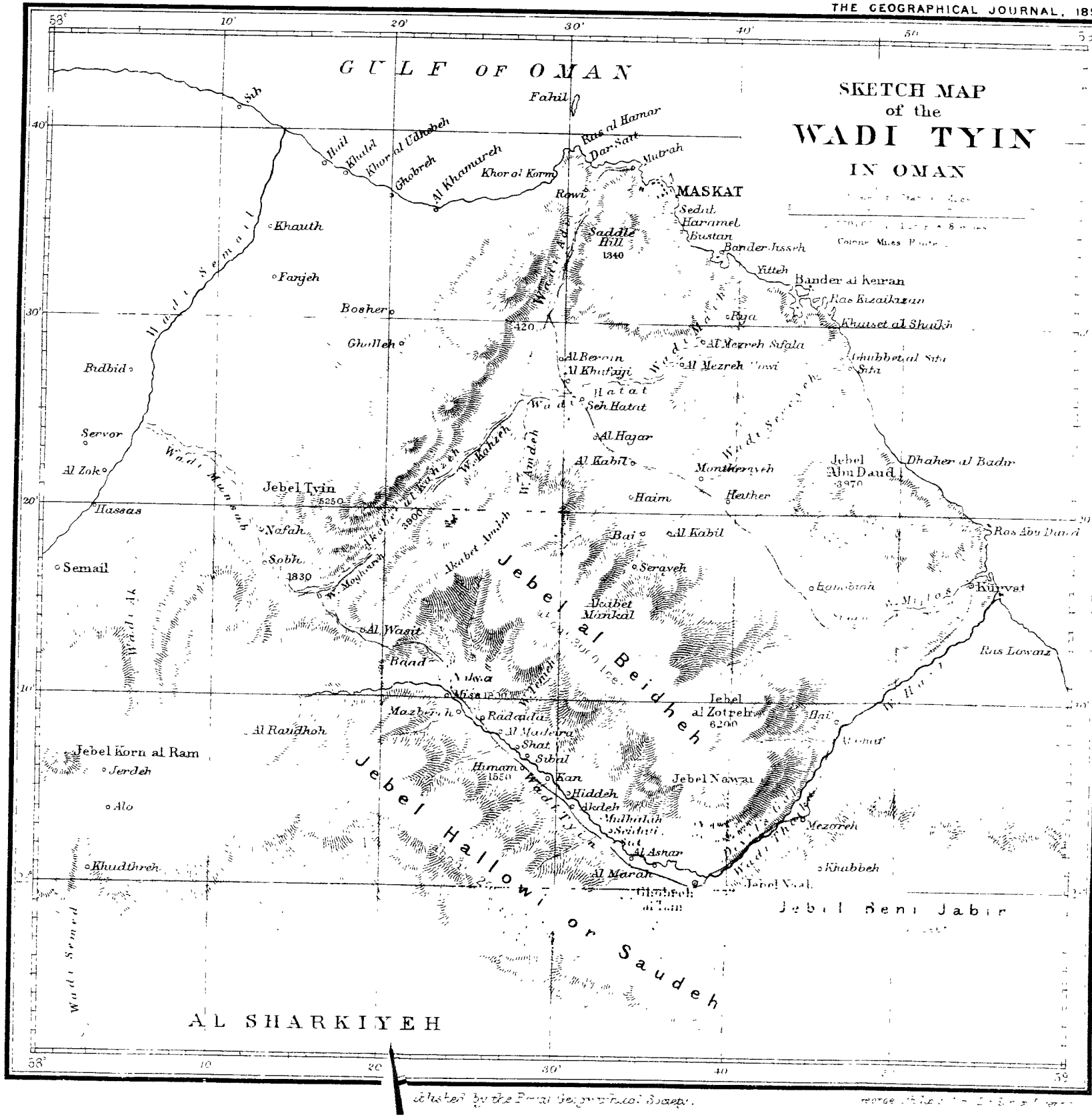
Waiho River
Waikukupa R.
Franz Josef Glacier
Mt Elie de Beaumont 10,200
Mt Green 9,305
The Minarets 10,058
Mt De la Bêche 9,816
Eyre Glacier
Barrs Saddle
Agassiz Glacier
Melchior Gl.
Blumenthal Gl.
Mt Roon 7,776
Zurbriggen Saddle 7,160
Fritz Glacier
Blackburne Saddle
Mt Zurbriggen 9,527
Mt Anderson 8,327
Mt Gaskell
Victoria Glacier
Rudolf Glacier
Tasman Glacier
Glacier Peak 10,197
Mt Haidinger 10,054
Chancellors Ridge
Fox Glacier
Fox River
Mt Tasman 11,475
Mt Silberhorn
4,188
Murchison River
Balfour Glacier
Mt Cook 12,349
Ball Glacier
Ball Hut 3,402
Empress Gl.
La Perouse Glacier
Ball Pass
Baker's Saddle 6,900
Hooker Glacier
Cutter's House
Cook River
GILLESPIE'S BEACH (Township)
Ferry
Cook River
Cook River
Salt Water Creek
Strauchan Glacier
Marchant Gl.
Fitzgerald's Pass
Lyttle's Peak 7,386
Rudra R.
Douglas River
Mt Sefton 10,359
Hooker River
Tasman R.
Tasman River
Architect Creek
Copland Valley
Scott's House
Copland River
Karangarua R.
Twain River
The Hermitage 2,500
Mt Sealy 8,631

Mr Fitz Gerald's routes shown thus ——
Heights in feet above the Sea.

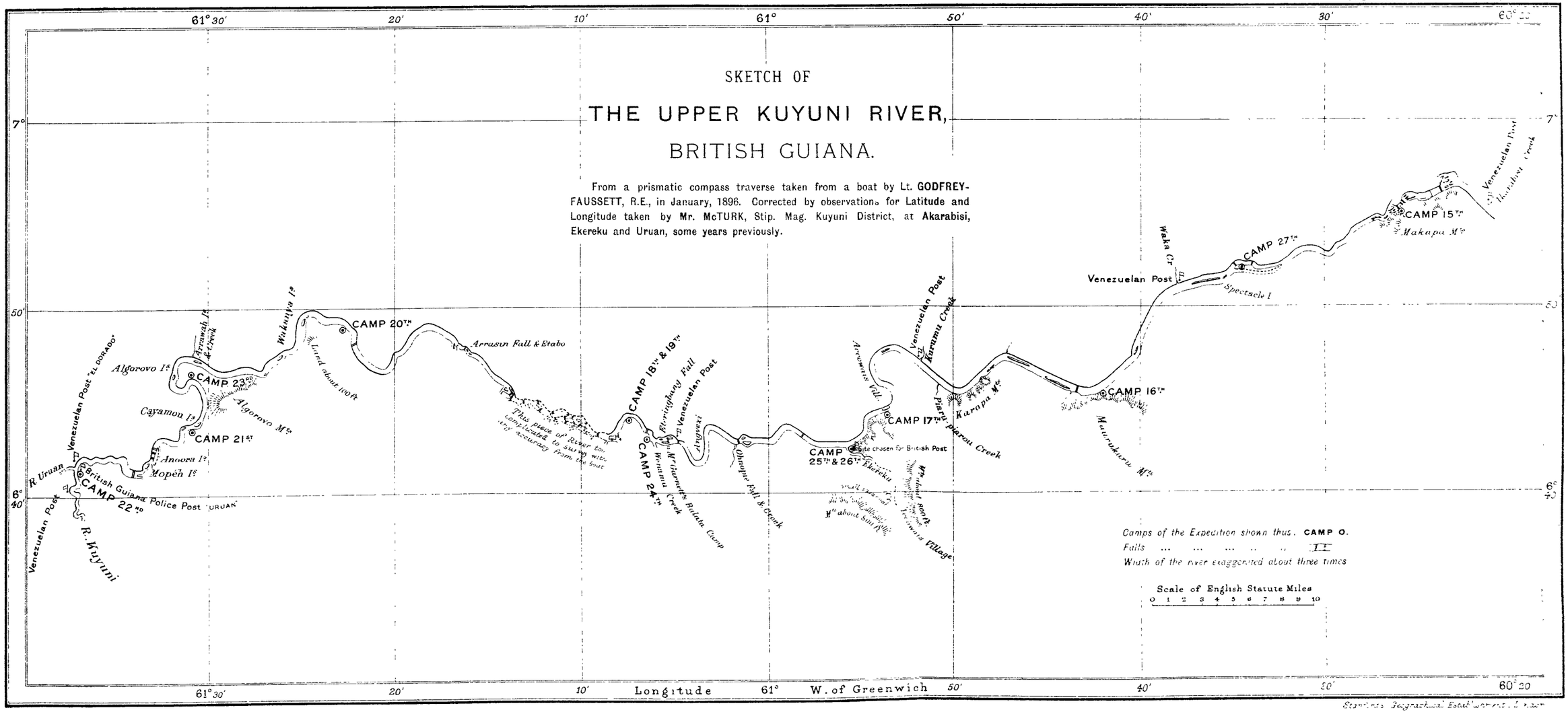


Published by the Royal Geographical Society

Stanford's Geographical Establishment



Plotted by the Royal Geographical Society.



Published by the Royal Geographical Society.

The
Geographical Journal.

No. 6. JUNE, 1896. Vol. VII.

THE COUNTRY OF THE SHANS.*

By Colonel R. G. WOODTHORPE, C.B., R.E.

I am not going to-night to tell you tales of stirring adventure, or of lengthy travels pursued under trying conditions, of hardships so cheerfully borne and privations so gallantly endured that we feel proud, not only of our countrymen, but also of our country-women. Such tales you have lately listened to; and the adventures of Mrs. J. G. Scott, who has accompanied her husband in all his travels, would make a thrilling narrative. I cannot tell you of visits to hitherto quite unknown peoples; nor, except in trifling matters of detail, has our recent work on the Mekong (Mekawng is the correct spelling) added to our geographical knowledge. The country I propose to describe to-night has been traversed by others, and descriptions of the tribes inhabiting it are to be found in the writings of many previous travellers. Francis Garnier, whose adventurous career is full of fascination; M. Pavie, the distinguished explorer to whom the French colonial party owes so much, and whose acquaintance I had the pleasure of making on the Mekong last year, with M. Lefevre Pontalis, his able lieutenant; Prince Henri D'Orleans, whose late wonderful journey must excite our warmest admiration (though, as a patriotic explorer, I may perhaps be permitted a passing regret that success did not crown my repeated endeavours to have some of the problems on our own frontier, which the Prince claims to have solved, solved by British explorers instead); my brave friend, Lieut. Otto Ehlers, whose untimely death, it is feared from starvation, geographical societies, as well as his friends, deeply deplore; Mr. J. G. Scott, well known in the literary as in the political world;

* Paper read at the Royal Geographical Society, March 9, 1896. Map, p. 688.

Lord Lamington; Captain G. J. Younghusband, whose adventurous journey to Keng Tung at the critical period when we first occupied Mandalay, showed him to be a true chip of the old block;—all these have written eloquently about the Shans and the hill tribes of Indo-China. All I can do is to open for you the gate into this fertile field, and to endeavour to attract your attention to this most interesting corner in the Far East.

The Shan States under British protection form the easternmost portion of our Burmese possessions, and may be said to lie approximately between the 19th and 24th parallels of latitude, and the 96th and 102nd of longitude. They do not, however, by any means cover the whole of the area included between these parallels, but, presenting a broad base towards the Irawadi, narrow down considerably towards the east, forming a rough triangle. To the west lie the great plains of Burma proper, traversed by the Irawadi. To the north and east we have the province of Yunan, with the Chinese Shan districts of Mung Lem and Keng Hung immediately on our borders. To the south are the Karen hills and Siam.

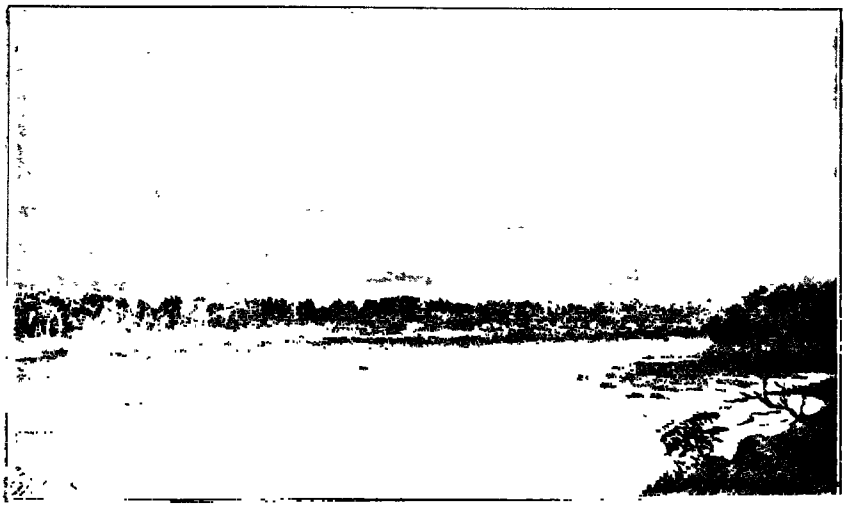
These states present a remarkable variety of natural features. The country to the west of the Salwin is a series of elevated plateaux—great rolling grassy downs separated by deep valleys and intersected by lofty parallel ranges, the general direction of which is north and south. These ranges, in contrast to the yellow downs, are beautifully wooded, and attain to great heights, some of the peaks rising to nearly 9000 feet above sea-level, the general elevation of the plateaux being from 3000 to 5000 feet. Along the valleys flow swift rivers, now through dark and narrow gorges, pent between mighty cliffs, now through alluvial hollows with terraced rice-fields, among which they wind with many a curve. To the east of the Salwin the country is much broken up; no clearly defined range of mountains presents itself, but the eye wanders over a confused sea of forest-clad hills and narrow valleys, relieved here and there only by small oases till Keng Tung plain is reached, beyond which the mountains rise again range upon range in tangled masses to the Mekong. Across the Mekong we have similar features, flat fertile valleys, or terraced uplands lying amid intricate mazes of hills, the drainage system of which is the despair of the reconnoitrer who, limited as to time, and hampered by the exigencies of a boundary commission, endeavours to solve the puzzle from two or three coigns of vantage. In this, however, he is much assisted by the mist which lies in all the valleys in the early morning, clearly marking the courses of the rivers and larger streams, which are difficult to distinguish when garish day destroys all atmospheric perspective.

The Shan States are watered by many considerable streams, but there are only two drainage basins—those (1) of the Salwin or Nam Kong* and (2) of the Mekong, or river of Cambodia. The Menam, the

* Nam Kong is the Shan name; *nam* = a "river."

river of Siam, of which we have heard somewhat lately, lies between these two, and rises just south of the Shan States.

In the northern Shan States, the streams flowing into the Salwin are few and insignificant, the main drainage being into the Irawadi; but in the southern Shan States we find the reverse is the case, and the drainage into the Irawadi is inconsiderable, while several fair-sized streams, flowing south and following more or less parallel courses, empty themselves into the Salwin. These are the Balu Chaung * or Nam Lak, the Nam Pawn, Nam Teng, and the Ben Chaung or Nam Pang. The first is the river of Fort Stedman. It rises to the north of this



THE MEKONG ABOVE TANG AW.

place, and, flowing at first through forest, loses itself in a huge swamp merging into the Inle lake, a vast expanse of water 13 miles long and about 4 miles wide at its upper end, but narrowing towards the south. It is nowhere very deep, and the bottom is overgrown with long and tangled weeds, which rise nearly to the surface. The lake dwellings of the Inthas, an amphibious tribe said to have been originally brought as slaves from the province of Tavoy, rise on piles out of the water in groups near the edge, and floating gardens, on which are grown tomatoes, water-melons, gourds, and the pan-leaf vine, dot the surface of the lake around them. Many large villages are seen on either shore; monasteries and clusters of white pagodas, built on the extremities of the spurs running into the lake, are reflected in its placid depths; and on the eastern shore, lying back from the water on some rising ground, are the houses and barracks of Fort Stedman.

* The Burmese name; *chaung* = "stream."

The Inle lake is well worth a visit, and the method of rowing adopted by the Inthas is peculiar. Men and women are equally expert. They stand one at the bow and the other at the stern of the boat. The rower holds the paddle lightly in one hand to guide it, and, balancing himself on one leg, he works the paddle with the other by hooking the foot round the upper portion of the blade. They complicate matters further by frequently carrying a spear in the hand not occupied with the paddle, with which they transfix any passing fish. Their dexterity both with spear and paddle is wonderful, and they supply all the bazaars in the neighbourhood with fish.

At Fort Stedman travellers are warmly welcomed by the regiment stationed there, and in the winter most excellent wildfowl-shooting is to be had. Above Fort Stedman, 18 miles away and 2000 feet higher, is Taunggyi, the civil station, which has an elevation of 4800 feet above sea-level.

Here Mr. Hildebrand, superintendent of the southern Shan States, hospitably entertains visitors in a very nice house recently built for him by the government. Comfortable and well furnished, with a pretty and extensive outlook, it gives one the feeling of being in a pleasant little country house in England; and this feeling will be strengthened when Mr. Hildebrand has perfected his plans for garden and orchard, already fairly stocked and yielding a good supply of English flowers, fruit, and vegetables.

Fort Stedman is to be abandoned, and our garrisons advanced further east.

The affluents of the Salwin are not navigable throughout their length; waterfalls or rapids occur frequently. The largest and most beautiful stream is the Ben Chaung, or Nam Pang, which joins the Salwin 10 miles below Kenghkam. At Kenghkam it is a quarter of a mile broad, with lofty wooded hills on either bank, wooded islands breaking up its channel. Curious parallel ridges of rock rise to within a few feet of the surface in the cold weather, but the water is very still here, though just above it descends over a series of cascades among trees and shrubs which grow in lines and clumps right across the river. Again, at many points in its course falls of 30 to 40 feet occur, and as it approaches the Salwin, where the lofty green hills close in on it, it rushes down a steep descent in one long roaring rapid, for several hundred yards, a mass of foaming, white, tumbling waters.

At Kenghkam the river is crossed by boats, one of the regular ferries being here. It is on the main road to Keng Tung. The village is very pretty, and with its fringe of coconut trees suggests Ceylon. The height above sea is 1200 feet. There is a very curious feature a few miles above Kenghkam: a limestone ridge runs across the river, forming an island with a central spine of jagged peaks. I approached it from the south-east; here, at the ferry between two villages, the river

flows calmly by, disappearing into the deep shade of wooded gorges. Arrived on the island, a path leads one across some terraced fields to the foot of the peaks above mentioned; it climbs painfully up the rough limestone for nearly 200 feet, and the traveller thinks with anything but pleasure of the descent awaiting him round the corner. Imagine, then, his astonishment and delight when he turns the corner and finds that he is on the level of the upper branch of the river, a thunderous noise to the left, down among some dark trees, denoting its efforts to rejoin the lower half. Climbing a height of 30 feet alongside a beautiful waterfall fringed with tall feathery grasses, and turning another shoulder of the ridge, the traveller emerges on a lovely expanse of



WAN THAM.

meadow-land, through which the placid river gently flows, with as little care for the turmoil and strife awaiting it as any happy youth setting forth on life's rough way.

A curious disappearance of streams is a common feature in this country. Take, for instance, Sa On, a pretty spot among the hills. Above the village some rice-fields are shut in by a limestone ridge; through these fields runs a little stream, which makes straight for this barrier; it flows under and round some fallen boulders, and then disappears in a little chasm behind. Some 200 feet below, and a quarter of a mile away, it emerges from a lofty cave, and flows calmly onwards, through the terraced rice-fields and gently sloping valley. I have said this is a common feature in this country, and Lord Lamington describes

a similar disappearance on a very large scale at Mong Hang. I had too much work to do while I was there to find time to visit this spot, but Lord Lamington's account is as follows: "The cave where the river enters on its subterranean course is in a sheer face of rock some 200 feet high. The height of the cave is about 140 feet, its width at the entrance 300 feet, broadening in the interior to nearly 500 feet; the depth is about 300 feet. At the right-hand bottom corner, a tunnel, at an angle of 45° with the cave, provides a passage for the river. I followed this for some distance, but with no other result than that of getting wet. It is said of this cave that a cut teak log floated down never reappears, whereas an entire tree, with its root and branches, makes the journey successfully."

Mong Hang is just within our border on the road to Chieng Mai (Zimme), and Mr. E. B. Gould,* who visited the place in 1886, says, "It occurred to me that formerly this tunnel did not exist. This valley would then have been one deep mountain lake, having its outlet by the Me Sum into the Me Nam, the watershed being low here. This may then have been the lakes of Chieng Mai, the mention of which by old writers, and the non-existence of which at the present day, are difficult to reconcile." This is a very plausible theory, which would be still more so if this feature of the disappearance of a river into a hillside were less common; but perhaps lakes have formerly existed in each case.

The Salwin, in its course through the Shan States, is a deep river with strong currents and many rapids; steep wooded hills, rocky and precipitous, shut it in, with here and there a sandbank; paths follow the banks for short distances only. Ferries, many of them unimportant, are frequent, but the river is only navigable for short distances. The average width between the banks is 400 yards, and the width of water in the winter from 150 to 200 yards, though in places the rocks close in, and the width is only 70 yards. In the rains the river rises about 50 feet. Major (now Lieut.-Colonel) Barrow, who accompanied Mr. Ney Elias's mission in 1889–90, considered that a powerful light-draft steamer could ply on the Salwin between Ta Hué Pon and Kaukhnyat, a distance of 150 miles. Country boats can and do ply between these places. Below Kaukhnyat the river becomes unnavigable. Sixty miles below this place is Kyo Dan, the great timber depôt for the teak floated down from the Karenni country. A cable stretched across the river catches the logs, which are then made up into rafts and floated down the river to Kado, near Moulmein, where the revenue is collected.

On the east of the Salwin, its only important tributary is the Namkha, flowing through Nung Lem and part of the northern Shan States.

* Vice-consul at Chieng Mai.

We now come to the Mekong, which somewhat resembles the Salwin on a slightly larger scale. Lofty, or low, wooded banks dropping steeply to the water, huge masses of rock cropping up here and there, penning the whole river in dangerous seething narrows; strong currents, raging rapids, and huge sandbanks always changing their form and place;—these are the main features of the Mekong wherever we saw it. The ferries in this portion of the river are at Ban Lik, Ban Law, Pakha, Hsup Lwi, Keng Lap (on the road from Keng Tung to Mongsin), Tang Aw, Keng Hsen, and Keng Kong. At most of these ferries the current is somewhat strong, and there is risk of loss in swimming pack-animals across. The river is navigable between Tang Aw and Luang Prabang.



FERRY AT BAN LAW.

M. Pavie's party performed the journey in country boats, and Lieut. Simon takes great credit to himself, with justice, for having reached Tang Aw, or Tang-ho, as he calls it, in a gunboat. He wrote from that place on October 26 last—

"It is not without a certain satisfaction that I am able to date this letter from Tang-ho, a place which is the extreme limit of all possible navigation on the Mekong. I have succeeded in reaching this point, which is 2500 kilomètres from the sea, at an altitude of 475 mètres, in a gunboat, which has overcome all the obstacles of the Mekong without a scratch or the slightest accident. Men and vessel have come forth intact from these thousand dangers, and our flag can float proudly at the stern of the first steam-vessel which has accomplished this extraordinary feat with a success exceeding the most sanguine anticipations.

"At Tang-ho the Mekong is no longer a river. The stream, which is very much narrowed above Luang Prabang, is here a torrent falling in cascades over a distance of from 8 to 10 kilomètres, and forming for navigation a *cul-de-sac* where it is absolutely necessary to stop. To ascend further is out of the question even for canoes. The people along the banks have not even taken the trouble to build canoes, and you look in vain for an individual capable of using an oar, a punt-pole, or a paddle.* I know not how my successors may overcome the difficulty, but I feel certain that without more appliances than I could command, they will not get beyond Tang-ho. The country itself is scarcely inhabited up to Mongsin.

"The question of food keeps me busy. We have now only a little wine and such other provisions as are to be found on the spot. The crew of a gunboat cannot, like M. Pavie, get on with rice, dry fish, and muddy water. The very few villages along the banks of the Mekong are inhabited here by poor people. The only thing to be bought here is the sort of cloth which the women use for their skirts, and this is of poor quality. I am going to settle provisionally till my departure at Kiang-sen, a small capital dependent upon Kiang-hai, and peopled by a Laos colony from Kiang-mai. The people are not very interesting, and the authorities, bent under the Siamese yoke, look askance at the French as they do at Kiang-kong. But at present, thanks to our gunboat *La Grandière*, we are in a position to inspire terror, and, if need be, to make ourselves respected."

Another letter from a correspondent of the Society of Commercial Geography, Paris, is dated October 16 of last year. It is sent from Kiang-kong, and gives other interesting details. At Kiang-kong, it appears, which is the very centre of the territory formerly so much discussed as a prospective buffer state, the population consists of a strange mixture of border races, who were extremely impressed by the arrival of a French armed vessel. It appears also from this letter that, if the boat could go up to Tang-ho, it cannot so easily come down. It will have to be kept in the reach of Kiang-kong, but this fact was not looked upon as a disadvantage considering the presence of the English, who were then at Mongsin. The English had there at the date of this letter three thousand men, one thousand of whom were Europeans, and had built a bridge over the Mekong at Kiung-lap, so as to make a continuous route passing from Burma by way of Kiang-tong to Mongsin.

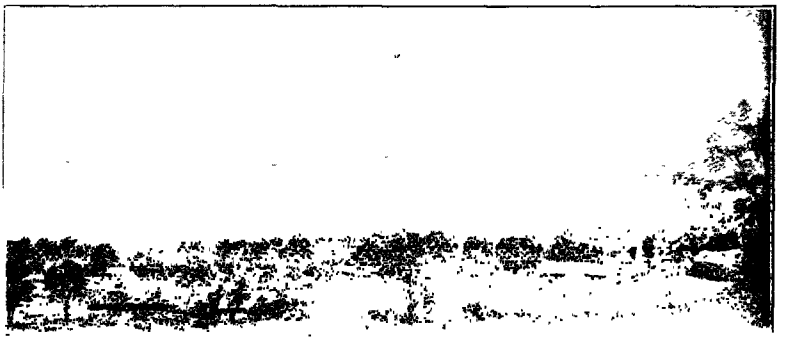
"They have declared," says the writer of this letter, "that the Mekong and both its banks between Kiang-sen and the place where the *Grandière* was lying belong to them, and, by way of asserting their claim actively, they have brought boats over from Burma to be set up

* M. Simon was ignorant of the existence of ferries above Tang-ho, apparently; nor could he have seen the rafts I have mentioned further on.

and put on the river here. This time we shall have got ahead of them." Another gunboat, the *Massie*, has now reached Keng Kong.

There was at this time a French agent at Kiang-sen, but Kiang-kong is described as an ugly and unhealthy place. There are magnificent teak forests in the neighbourhood (the *Times*, January 30, 1896).

At Ban Law ferry the Mekong has a width between the banks of 400 yards, and the stream in the dry weather is 160 yards broad. At Keng Kong the width between the banks is from 600 to 700 yards, and in March the breadth of the stream was 400 yards. A rise of some 40 or 50 feet takes place in the rains. Dr. Le Févre, the French physician with M. Pavie, explored the Mekong on a raft between Ban Lik and Keng Lap. It was rather a risky business, but he accomplished it in



INLE LAKE.

safety. At the worst rapid his boatmen insisted on his hiding out of sight the tricolour, which was proudly floating over his head. They explained that the spirit ("Nat") of this particular rapid never allowed safe passage to a raft that showed any red. Rafts frequently make the journey from Keng Hung to Keng Lap. They bring down salt, which is disposed of to the villages along the banks; and, arrived at Keng Lap, the owners abandon their rafts, and, picking up such goods as they require at Keng Lap, return to Keng Hung overland. These rafts are from 20 to 30 feet long, and from 12 to 20 broad. In the middle is a small bamboo thatched house, in which the crew sleep. They are neatly made, and at the door of the hut is frequently to be seen a pretty young woman, sitting among some flowers or small shrubs in pots arranged on either side, while a bright cloth hangs above her. I was detained at Ban Law for two or three days, waiting for the rest of the mission, and I frequently watched these rafts passing down a bad rapid with a huge rock in the middle, round which the waters raged with great fury. The raft would come gently down the calm reach above, and as it neared the rapid three long bamboo sweeps

were manned fore and aft by the six men of the crew, and, working with all their might, pulling and yelling like lost souls, they were borne irresistibly by, the woman sitting through it all as calm and unmoved as an image of the Lord Buddha. The principal affluents of the Mekong in the Shan States are, in the north, the Nam Lwi and Nam Lam, which join their waters in Keng Cheng territory, and thence flow together to the Mekong. The Nam Lam, for some portion of its course, forms the boundary between Keng Hung and Keng Tung. Below we come to the Mehuok, which now, for the last 20 miles of its course, forms the boundary between Keng Tung and Siam, and the Mekok, which was the old boundary before the encroachments of the Siamese twelve years ago. These encroachments do not seem to have annoyed the Shans much, and Shans and Laos lived side by side in the most friendly manner. Gould tells a curious tale of the friendly relations which existed between these peoples. When Burma and Siam were at war, Keng Tung and Chieng Mai were supposed to be respectively warmly maintaining the quarrels of their suzerains; but this was not really the case. There was an understanding between the chiefs that, while keeping up appearances, they should not really damage each other much. An arrangement was come to that there should be no bullets used except when Siamese soldiers were actually in the field. "It is a fact," says Mr. Gould, "that on one occasion the Chieng Mai forces, driven by the Siamese, arrived before Keng Tung, and a Chieng Mai prince obtained much *kudos* with the Siamese by forcing his elephant alone up to the very gate of the city, in spite of the fire from the garrison, from which he and his beast miraculously escaped unhurt. This feat is intelligible supposing the above understanding existed."

A small stream running into the Mekong at Keng Kong, called the Me Ing, is of importance, as its basin is reserved to Siam by the treaty recently concluded with France.

All along the banks of the Mekong, as indeed in many places on the Salwin, we came across innumerable tracks of wild animals and the pugs of enormous tigers; the latter, indeed, at Keng Kong, and elsewhere, caused us the occasional loss of a pack-animal which had strayed from the camp. In places on the banks I saw large holes dug in the sand and roofed over with bamboo and sand, small embrasures being left commanding the drinking-place of these wild beasts, for which shikaries with untrustworthy weapons lie in wait. I should be sorry to be in one of these holes with a wounded tiger outside thirsting for my blood. Much sport could be had in these hills by any one who could lay himself out for it; but it is impossible to combine sport with survey work—the conditions are incompatible. From Keng Sen to Hong Luk stretches a magnificent plain, and Gould, writing in 1886, says, "Already the big game, which ten years ago was found in abundance on this plain, has retired before the sounds of human labour. Rhinoceroses and wild cattle, which formerly

could be found close up to the walls of Keng Sen, have now disappeared. Herds of deer, however, may still be seen as the traveller crosses the sea of long grass, sparsely dotted with trees, which covers the plain." I have crossed it twice, but was not so fortunate as to see any herds of deer. The last time, though, I saw and shot a brow-antlered deer, with small but very symmetrical horns.

The climate of the Shan States is generally good in the cold weather. The nights are cold till April, and the heat, though great in the valleys, is seldom so oppressive as at Mandalay or Rangoon. Frost is experienced in some parts, but snow, of course, never. The rains begin in the end of April or beginning of May, but there is frequently a break of a week or a fortnight at the end of May. Good hill stations for troops could easily be found; and the sickness we hear of at Keng Tung and Mong Hsing is probably due to imperfect housing and the selection of indifferent sites, necessitated by want of time. The following record of temperature may be of interest. I find that my observations for the Salwin and Mekong give the same average results, *i.e.*—

			Dec.	Feb	March.	April.
Average height 1200 feet.	Mekong Salwin	Min.	53°	58°	65°	66°
		Max.	80°	83°	88°	90°
			Jan.	March	April.	
Average height 2800 feet.	At Keng Tung	Min.	40°	53°	66°	
		Max.	85°	85°	90°	

Keng Tung, it will be seen, is always warm during the day, the maximum temperature for the different months varying less than the minimum.

The average minimum temperature of the plateaux rises from 45° in December to 60° in April; and the maximum from 70° to 90°, falling to 80° during the rains.

I have alluded to the mists which lie in the valleys every morning during the cold weather. They occur all over the countries on our north-east frontier, from the Brahmaputra to the Mekong. These mists fill all the valleys and cover all the lowlands till a late hour every morning. In Mong Hsing they seldom rise before noon; and through the damp forest or long wet grass eager to deposit its dew on the traveller's clothes, wetting him through and through at once, the early march is made in a horrible twilight, not born of the dawn, but of dull grey mists, in which the sad trees look dim and unreal; and the sadness of the scene is rendered more melancholy by the plaintive cries of the monkeys protesting against the misery of life. But suddenly the fog lifts and disappears, and with the lifting of the veil the traveller finds himself in the midst of glorious summer sunshine; a gorgeous transformation, and it is difficult to believe that this brilliant sun, these glowing hills, and fertile plains, have been there all the time, hidden by that grey drop-curtain. I found on the Mekong, going down from sunlight into the dark valley, that the thickness of the mist stratum is

from 800 to 1000 feet, and that it does not descend quite to the valley, but hangs at a height of 200 feet above it. Out in the open lowlands it lies quite low.

Many hot springs are met with in the Shan States, and at some places split bamboos are placed over the streams, which deposit sulphur in the form of flowers on the under surface; this is collected and compressed into cakes for sale.

Communications in these states are confined to a few well-defined tracks, and these are not very good, even for pack-animals. The path from Taunggyi to Keng Tung was last summer widened and improved, and made into an excellent mule-track, where two laden animals can pass each other without one of them going over the side. This work reflects great credit on Mr. Litster, executive engineer at Fort Stedman, and his assistants, who carried it out at a very unfavourable season, and in the face of great difficulties.

I do not think that sufficient expert exploration has as yet been done with a view to improving the communication and developing the resources of the country. The navigation of the Salwin might possibly be rendered easier, and the teak trade would be largely benefited by increased facilities for exporting it. Work has been begun on the line of railway from Mandalay to the Kun Lon ferry on the Salwin. It is hoped that it will tap the trade of Western Yunan. I should have been glad to see a line run up into the Southern Shan plateau, at least, if not to the Salwin itself. The construction of the cart-road to Taunggyi has had most excellent results; but a line of rail would, in the opinion of many qualified to judge, greatly advance the agricultural wealth of the country. Potatoes have already been very successful, the cultivation of wheat should be very remunerative, and a brisk trade in vegetables and fruit might be established, while, as Mr. Hildebrand says, there is a pasturage for sheep equal to that of the Wiltshire downs. This line, I venture to think, would be most useful both strategically and commercially.

The Shan States include those of Keng Hung and Keng Cheng, which lie on either side of the Mekong. Keng Hung is composed of twelve districts, or "pannas," and is sometimes called the "Hsip-Hsong Panna," or "the twelve districts." Six of these lie to the west of the Mekong, and six to the east. The latter portion is described as a pathless mountain tract, sparsely inhabited. The adhesion between the eastern and western pannas appears to be slight. The well-known Pu-Erh tea is grown on the left bank. At a hill called Pufang (in Burmese, Alanlegyat) = "four flags," it is said that Burmese, Tonkinese, Chinese, and Siamese devotees all erected pagodas to mark the meeting-place of four empires.

Keng Hung owned allegiance for many years both to Burma and China, and during part of the present century Burmese influence was

powerful. In 1878 Mindon Min appointed a prince as sawbwa* of Keng Hung, but he was unable to extend his influence over the trans-Mekong pannas, and eventually he was driven out, and a relative of the Keng Tung sawbwa installed. During Thibaw's reign, Keng Hung seems to have been practically independent of both Burma and China, till we recognized China's claims by handing the province over to her. In 1893 a Chinese governor, with a guard, installed himself in Keng Hung.

In Garnier's time the capital of Keng Cheng was at Mong Yu, on



WESTERN SHANS.

the western bank of the Mekong; but later the chief moved across the river, and established himself at Mong Hsing, of which we have heard so much of late.

Of the Cis Mekong States which are now under our control, Keng Tung, embracing most of the country lying between the Salwin and the Mekong, is, from its size, population, and geographical position as our frontier state, the most important. The present ruler is, moreover,

* Sawbwa = ruler.

connected by family ties with most of the other important Shan States. At one time the advisability of stopping our frontier at the Salwin was much considered and discussed, but was finally rejected. We could not, except on considerations of mere convenience, have stopped short there. The relations of the trans-Salwin Shan States to the kingdom of Burma, their connection with each other, the ties that bind them to the Cis Salwin States, the effect which our withdrawal or holding back would have on our prestige, the asylum which they would afford to malcontents and *mauvais sujets* of all sorts as an Alsatia whence they might safely intrigue against British interests and influence, and the danger of rulers and people forming other alliances if cast off from Burma, were considerations which proved too strong for the most cautious advisers of the government, and few will now dispute the necessity for, and wisdom of, our advance.

Dr. Cushing, a missionary and a great Shan scholar, visited these states while under the Burmese rule. He tells us that under this rule peace and quiet were seldom their lot. "Divide and govern" was the maxim which guided the policy of the Burman sovereigns towards their Shan dependencies. The sons of sawbwas were sent to the Court of Ava, partly as hostages for their fathers' good behaviour, partly to be trained in the way that they should go, the Burmese way, when they succeeded their fathers. The Burmese Government often fostered feuds which broke out between sawbwas, and left rival princes of one family to settle their claims to the control of a principality with the tacit understanding that the victorious claimant would probably be confirmed as sawbwa by royal appointment. Intestine troubles were frequently fomented by Burman intrigue when a prince seemed likely to become too prosperous for the safety of Burman authority. Bands composed of desperate characters were ever ready to avail themselves of the opportunity afforded by disturbances in any principality to murder and plunder, the result being that the people emigrated to some neighbouring state enjoying peace. Rebellions against the royal authority were always sooner or later ruthlessly suppressed, towns and villages being burned, and the country devastated. Dr. Cushing adds that the absence of permanent peace seriously affected the prosperity and wealth of the country. The Shan States, lying east of the Salwin, were, however, less obnoxious to Burmese oppression than those to the west of that river. When the Burmese troops were withdrawn from the Shan States to oppose our advance in 1885, anarchy reigned supreme, and for two years after our occupation of Mandalay, we had our hands too full in putting down dacoity and rebellion in the plains of Burma to turn our attention to the Shan States; but gradually, and with but little bloodshed, order was restored in the Cis-Salwin districts, the sawbwas submitted to the British Government, and their submission was genuine. Trans-Salwin Karenni was recovered from the Siamese,

and, with the assistance of the influential and loyal sawbwa of Moné, Keng Tung was peaceably brought under our rule.

At first, only one superintendent was appointed to the Shan States, but as our influence was extended, this was found too large a charge for one man, and the states were divided into the Northern and Southern Shan States, and each placed under a superintendent with several assistants, who exercise general supervision and control. The distinction between the Northern and Southern Shan States is purely an artificial one, and due to the different political circumstances in which they were placed immediately after the downfall of the Burmese monarchy. Except for the peace and general security now enjoyed, things have not altered very much. As before, each state is ruled by its own hereditary chief, who has the power of life and death, and absolute authority in his own state, so long as his rule is in accordance with the principles of justice and benevolence, and free from the oppression and cruel practices of former times. Certain sources of revenue are reserved by the Government, and the rest of the revenue is a lump sum levied on each state as tribute. To the devoted labours of our political officers, Messrs. Hildebrand, J. G. Scott, Captain H. Daly, and their able assistants, to their resourcefulness in emergencies, and their infinite tact and skill in dealing with both rulers and people, the Shan States owe their present peaceful and happy condition, and their increasing prosperity.

Mr. Pilcher writes thus of the Shans: "The Shans, or Tai, as they call themselves, are the most extensively diffused, and probably the most numerous of the Indo-Chinese races. Lapping the Burmese round from the north-west, they are found from the borders of Manipur (if the people of that valley have not been, indeed, themselves modified by Shan blood) to the heart of Yunan, and from the valley of Assam * to Bangkok and Cambodia. Everywhere Buddhist, everywhere to some considerable extent civilized, and everywhere speaking the same language, with little variation—a circumstance very remarkable amid the variety of tongues that we find among tribes in the closest proximity of location and probable kindred throughout those regions. This substantial identity of language appears to indicate that the Shans had attained at least their present degree of civilization before their so wide dispersion. The traditions of the northern Shans, as well as of the Siamese, speak of an ancient and great kingdom held by this race in the north of the present Burmese empire; and of these traditions the name of 'Great Tai,' applied to the people of that quarter, appears a slight confirmation."

* The Khamptis mentioned by Prince Henri d'Orléans are Shans. He says, "We are surprised to find in the Khampti country Thans, *i.e.* Thais, speaking the language of their brothers on the banks of the Mekong, using a writing similar to that which we find from the Canton river, from the middle of Yun Nam among the Pais, even to the mouth of the Menam."

Mixed up with the Shans we find a wonderful variety of more or less wild tribes. These various tribes inhabit the hills and wilder parts of the country, the Shans occupying the alluvial basins.

Rice is grown everywhere in the Shan States. There are two systems of cultivation, one on terraced and irrigated land, the other on the hillsides. The former is that adopted by the Shans. There are three crops; the first grown in dry weather on land altogether artificially irrigated by means of dams and huge waterwheels; the second on lands wetted by the first rise of the streams; the third and main crop during the rains. Very pretty little fenced-in gardens are common along the banks of streams flowing past villages. The Shans never use bullocks for ploughing, but buffaloes only. Their hills have been visited during



A KAW VILLAGE ABOVE THE MEKONG.

the past few years by the cattle plague, from which they suffered severely.

The largest cultivated plain, Cis Mekong, is that of Keng Tung, which, with the town itself, is deserving of some notice. This plain is about 10 miles long and varies in width, its average breadth being about 5 miles. The huge spurs from the high ranges on either side break up, as they descend into the plain, into gentle undulations. To the north and east the plain is perfectly flat and covered with rice-fields, intersected by irrigation channels; to the south are gently swelling downs and low grassy hills, swampy hollows lying between. The town of Keng Tung covers some undulating ground on the western side of, and overlooking, the plain. Its walls have a perimeter of some 5 miles; they follow the undulations of the ground, standing highest above the plains on the north, where a pagoda, with a curious umbrella-like tree growing from its summit, forms a striking landmark. The walls, which are somewhat ruinous, are crenelated and loopholed, and protected generally by a formidable ditch some 25 feet deep, and V-shaped—a very difficult object to negotiate at the best of times. Where the walls descend to the level of the plains the ditch disappears,

but marshes cover this portion. There are several arched gateways, protected by brick and earth traverses; one to the south gives egress to the road leading to a fine large tree called "Execution tree," where, under its spreading branches, executions used to take place on the large market-days. The prisoners were led through the crowds in the market, and given drink at the various liquor-booths.* A strong escort with bamboo ropes kept off the crowd. At the place of execution the name of the condemned man and his crime were read out by the official in charge of prisons, etc. (a court minister), and the slip of bamboo on which they had been written tossed over the man's head. He was then made to kneel down with his arms tied tightly at the elbows behind his back, and was decapitated with a long knife. The head was not held. This is evidently similar to the Chinese method.

There is very little level ground within the walls of Keng Tung, and only the northern and eastern portion of the space enclosed is built over; and even this portion is somewhat overrun with trees. There are several weedy swamps, the largest being Nong Tung, or the lake from which the town takes its name. The sawbwa's palace stands close by, and is a collection of fine teak buildings, well and solidly constructed, and surrounded by a brick wall. There are from 1500 to 2000 houses inside the walls, and these are substantially built, some with brick basements, the upper walls of planks or bamboo matting, some with the side walls of the upper story also of brick. They are roofed with small, well-made tiles, which afford protection against fire.

The monasteries and churches are very numerous, and each stands in its own walled enclosure, entrance to which is through a massive gateway, suggestive of the *Paifang* of China. The style of ecclesiastical architecture here differs considerably from that of Burma and the Western Shan States. In the latter the monasteries are all of wood, and built on piles, raising the floor to a height of from 5 to 6 feet. In the east, although the houses are all raised, the churches are built on the ground, with low brickwork walls, the upper portion being of wood, often richly painted and gilt. The roofs are tiled. The plan of a church is the same as we adopt—a nave and two aisles, with at one end the high altar, with its huge gilded figure of Buddha, with smaller figures in front, propitiatory- or thank-offerings of the pious villagers. The interior of the church is rich with carving, with effective mosaics of silvered and coloured glass, with frescoes, vermilion, and gilding. Votive offerings, in the shape of quaint umbrellas, large banners, and streamers resembling gigantic crackers hang from the roof; and a gorgeously carved and decorated pulpit is a conspicuous object. In March, 1893, when we were in Keng Tung, a two days' service was being conducted, and in the

* Compare a scene depicted in an old print in the Scotland Yard Museum of prisoners halting to drink at the Baptist's Head, John Street, the day of removal from New Prison to Newgate.

royal chapel we found the aisles filled by people who were regularly camping there, among them some of the royal family, with the heir-apparent. They had their rugs and pillows, all appliances for chewing. pan, silver bowls, spittoons, and boxes, and many other household gods around them, and looked exceedingly comfortable. Around the church hung special offerings. Beautifully worked cloths by the queen dowager and princess of Keng Hung, to be placed over the image of Buddha, were on view; and around the altar a most miscellaneous collection of offerings for the church and clergy, from expensive silk robes to an empty Worcester sauce-bottle enclosed in wickerwork. The pulpit was a handsome temporary erection of bamboowork, covered with tinsel, coloured paper, etc., and harnessed to two very creditably constructed white horses, with gay trappings. In front of them, and at their feet, were pots of flowers and large-leaved plants; and extending down the nave in a double row were sets, each complete in itself, of gifts for the preachers, or readers would perhaps be more correct, who occupied the pulpit for about three-quarters of an hour each. This reading was continuous, and as each priest was relieved by his succes-or, he picked up his packet, containing a set of yellow robes, girdle, pair of slippers, umbrella, large palm-leaf fan, and pagoda-shaped lacquer box, and departed, so that the state of this line of presents gave an observant worshipper some idea of the progress of the service. However, the worshippers were not obliged to be present throughout, and the Keng Hung princess gave Mr. Hildebrand and myself an audience in the palace before we visited the church, which, with its lavish decorations, curious show of presents, the flowers, lights, and monotonous chant of the priests, gave us a quaint impression of assisting at once at a religious service and a fancy fair. The latter illusion was speedily and pleasantly destroyed by our not being asked to buy anything.

Adjoining the churches are well-built and comfortable clergy houses. The clergy in the Eastern Shan States are less orthodox than those in the west, and are called "Htu," or "imitation priests," by their stricter brethren. It is not unusual to see a priest riding in great state, with a cap on his head, and a long knife, or even a gun, slung over his shoulder.

I made many friends among the priests and their pupils while sketching their beautiful temples, and many were the games the boys had with a very intelligent terrier, who was never so happy as when hunting for some stick or stone hidden by his young friends. Many were the inquiries for my little dog when I revisited Keng Tung last year, and loud the lamentations at the news that he was dead. Among the inmates of the monasteries, the Chinese custom of allowing one nail to grow long, as a token of exemption from manual labour, is common. This nail is supposed to be useless, but I saw a little boy use it once as a spoon when tentatively tasting some preserve I had given him and his companions.

Many large and populous villages lie in the Keng Tung plain, and under its walls is a large colony of Shan Chinese, or Shan Talok. Theirs is an old settlement, and they have a handsome church of their own. Their houses are built of bamboo, and the village is very dirty, by reason of the goats, ducks, fowls, pigs, and cows which crowd the village street. They are good gardeners, and grow many good vegetables. They do a thriving trade, and are great workers in clay, supplying Keng Tung with most of the cheap pottery to be seen in the bazaar. Cloths, tinned milk, and matches are procurable in the shops in Keng Tung; and, besides three small market-days, on every fifth



KENG KONG.

day a big market is held, when the large open space within the east gate is thronged by a motley crowd, representing all the various tribes from the surrounding country. The quantity of goods displayed and their variety are very great; they include English and Indian cotton goods and yarns, Manchester silks, gaudy handkerchiefs, aniline dyes, Japanese matches, powder and caps, needles, etc. Chinese merchants sell large straw hats with oiled silk covers, raw silk, fur coats, iron pots, quicksilver, and rock-salt. The Chinese are also the butchers and shoemakers. The country women bring to market excellent cheap oranges, various fruits, and vegetables. A great trade is done by the liquor shops (shamshu); and the restaurants, where hot cooked food is sold, are well patronized.

The Shans have a very simple still—a wooden cylinder, with a false bottom of wickerwork, stands in an iron boiler with a packing of cloths

over a fire. On the top is a copper pan with another packing of cloth where it rests on the cylinder; beneath this pan, suspended by threads and weights hanging outside the cylinder, is a small wooden saucer, with a spout passing to the outside. On the wicker bottom a sticky kind of rice with balls of rice flour and certain jungle leaves pounded together are placed, and the fire lighted. The copper pan is kept continually full of cold water. The spirit passes up from the rice, etc., in the form of steam, and is condensed on the bottom of the copper pan, whence it drips into the saucer, and flows out through the spout into the bamboo placed to receive it. I saw one of these under a house in Mong La. A lady was superintending operations, and gave me some of the spirit, and I liked it. She then showed me her house; a fine room, raised from the ground 8 feet, was divided up into a general sitting-room with several little sleeping-cabins matted off, each containing one or two bed places, with their dark blue and somewhat thick musquito curtains. Above was a loft containing many household implements. Small stools stood in corners and round the fireplaces.

Time and space fail me to tell of all the various hill tribes to be met with in this interesting country. The mere enumeration of some of them will show how impossible this would be; *e.g.*, we have the Kaw, Kui, Kun Loi or Tai Loi, Miao, Muhso, Palaung, Lanten, Taungthu, Wa, Yang Sek, Yang Lam, Yao Yin, and others. Of these, the Palaungs are scattered over all the Shan States. They are Buddhists, and their "wats" and temples are frequently very handsome and elaborate little buildings. They are the gunmakers of Keng Tung; and Captain Walker, D.C.L.I., of the Indian Intelligence Department, who did much excellent work on this frontier, gave me the following information concerning the manufacture of these firearms. There are three villages employed in gunmaking. Formerly the weapon was merely a gaspipe with a flint lock. Now the pattern adopted is the Tower musket for percussion-caps. Pistols of the same pattern are also manufactured. The barrel is made of iron bar, and the bore drilled, the exterior being then worked down and smoothed on a grindstone until round and polished; the touch-hole is also drilled. The barrel is then fixed to a block of wood, which is afterwards shaped into a stock. The locks are fitted on last. They are sold for 9 to 12 rupees. They are not very safe weapons for the owners, as a sepoy discovered to his cost. Borrowing a gun, which Captain Walker had bought for his interpreter, to go and shoot doves, he nearly blew his hand off at the first shot, the gun bursting close to the breech. The material of the guns is very inferior, and the man probably used too large a charge.

Captain Gordon, who was at work on the survey of the Western Shan States, tells us that there are over twenty tribes, distinct in dress, customs, and often language, to be found in the country west of Fort Stedman. Like all the people of these hills, they are unambitious and

unenterprising, but cheerful and fond of amusement. The wife does all the housework and a large share of the outdoor work as well. At a Taungthu village, which had suffered from the cattle plague, I saw a woman dragging the plough, which her husband guided.

The Muhso * is another largely scattered tribe, broken up in several subdivisions. They came originally from China, and many are still to be found there. There is said to be an independent Muhso king beyond Keng Hung northwards. There are two great divisions of Muhsos—the Red and the Black, these terms being supposed to refer to the difference in dress. In both the general colour is dark blue, very nearly



MONASTERY, PUNG PYIN.

black; but the sleeves of the jackets and legs of the trousers of the Red Muhso men are ornamented with red and white rings.

Their religion consists in a belief in one great spirit, and many lesser spirits of the groves, streams, hills, rivers, forests, etc., to whom offerings of rice and vegetables are made. Even among this simple people we find the *odium theologicum*, for the Red Muhsos accuse their Black brethren of heresy in offering meat, as well as rice and vegetables, which is abomination, while the Black Muhsos accuse the Red of offering to unorthodox spirits.

Captain H. R. Davies, O.L.I., also a valuable officer of the Indian Intelligence, a great linguist, accompanied me on my first visit to a Muhso village. He had an attack of fever, and had to shut himself up in his tent as soon as it was pitched. Shortly after, the Muhso chief, aged about ninety, came to see us with offerings of forbidding-looking chunks of pig. One of these, he explained, was especially intended for Captain Davies. I said he was ill, but that I would give it to him when well enough. I suppose I did not look honest, for I soon saw a man engaged in hanging this hideously untempting, hairy piece of pork to a tree-stump just outside Captain Davies' tent door, at the height of his eye,

* It has been said that this word is the Shan word = "hunter," and that these people are so called from their reputation as hunters.

so that he would catch sight of it the moment he emerged; the result was a relapse on the patient's part.

The Muhsos have a curious annual festival on the Chinese New Year's Day. It lasts about five days. During this feast no stranger is allowed into the village, bamboo gateways and symbols being erected along the paths to the villages, to warn him off. This custom is well known and respected by Shans and Laos. I had a camp in a village once, from which I moved to a hilltop near. On my return, during this season of "Taboo," I found an excellent path cut round the village. As I could not pass through the village, the villagers had been good enough to facilitate my journey round it. I found them always pleasant and civil; they would sit round the camp fire in an evening when I had tea, and in return for biscuits and sugar and a display of mechanical toys, would give me selections from their national airs, on their curious little instruments of two kinds; one, a gourd with bamboo pipes plastered in with beeswax, each pipe having a small metal tongue let into it. The sound is soft and low, rather like a harmonium softly played. The other instrument is a kind of Jew's harp of split bamboo, and not an easy thing to perform on.

I saw a very curious sight at the burial of a Yang Lam chief. Halting one midday for breakfast under a big tree, by a small lake lying at the foot of a frowning limestone cliff, I noticed many young men bathing on the far side, while nearer many women and girls were washing their long hair. Inquiring the meaning of this, I was told they were on their way to a chief's funeral, and this washing was a necessary preliminary—probably only because they had travelled some distance. I went up with them to the village, where many camp kitchens, in pretty groves of trees, furnished a plentiful repast of rice, stewed vegetables, and buffalo-hide to all comers, including myself and attendant interpreters. When all was ready, a gaily decorated coffin, containing the deceased, was carried out and placed on a heavy wooden sleigh, and a gorgeous canopy, of gold and coloured paper and tinsel, placed over it. Two long bamboo ropes were attached to each end of the sleigh, and to these about two hundred men and boys, women and girls, harnessed themselves. The head-men waved their big straw hats and cried, "Pull for your lives," and a regular tug-of-war commenced, and the corpse was dragged up and down hill, over the uplands and into the swampy hollows, a rope breaking now and then and upsetting all its pullers, who went tumbling over each other downhill among the bracken, amid much merriment. This lasted two or three hours till sunset, when the coffin was lowered into a grave, dug under a wide-spreading tree, by which several yellow-robed priests had been solemnly sitting; a few prayers were said, exhortations given, and presents offered to the priests; the grave was filled in, the gorgeous canopy placed above it, and the mourners (save the mark!) departed.

I could not find out what this ceremony signified. I have an idea that it originally symbolized the struggle of the powers of good and evil for the dead man's soul.

The inhabitants of the Shan States suffer from fever in the low-lying valleys, and small-pox is an ever-present scourge, as the disfigured faces of too many Shans evidence; influenza also has, I believe, invaded even this distant and uncivilized tract.

My party has been fairly healthy generally during our survey work in the Shan hills; but every one has not fared so well, and it was with the greatest regret that I learnt from M. Pavie, in November, that Captain Riviere died, after much suffering, on the Mekong, in May, on his way down from Luang Prabang. He left us in March at Keng Kong, and was very ill then. He had charge of the survey operations with M. Pavie; and he and I necessarily saw much of each other at first, and I formed a sincere friendship for him, which, I am pleased to think, he reciprocated. He was a pleasant companion, enthusiastic about his work, and eager to pick up anything new to him which the system of the survey of India, which he held in admiration, could show him. He had done much excellent work with M. Pavie on previous missions, and had been decorated for his services. He is a loss alike to science and the French army.

We were able to carry very good triangulation across the Shan hills to the east of the Mekong, where we joined on to the peaks fixed by Mr. J. McCarthy during his splendid work in Siam, of which I cannot speak too highly. His assistants were Siamese trained by himself.

I cannot close without urging again, as I did at the Society of Arts, the loss to ethnology if the language, manners, and customs of the many interesting tribes I have referred to are not studied carefully and soon by some one competent for the task, and willing to devote some time to the work. Travellers may collect and give to the world of science many interesting facts and much valuable information, but at best their researches can only be superficial. In the words of my friend Mr. Warry, adviser on Chinese affairs to the Government of Burma, "The chance of studying these peoples to full advantage is fast slipping away. Up till now they have been almost entirely isolated, owing to the insecurity which has prevailed in the regions where they are settled. In consequence, they have, no doubt, preserved their languages and institutions in a far purer state than members of the same races who have lived under happier and more peaceful conditions elsewhere. Now, however, an era of peace seems to have set in. These tribes are in constant contact with the outside world; their languages are undergoing modifications, or dying out, and their customs are being assimilated to those of the Shans and Chinese. Many illustrations of this have come under my observation during the past half-year. I would therefore recommend any one who is interested in such inquiries to come

before it is too late; the inducements are surely sufficient: a good climate, in the midst of splendid mountain scenery, simple, friendly folk to live among, and an occupation full of interest in itself, and sure to lead to results of permanent value."

Before the reading of the paper, the PRESIDENT said: It is scarcely necessary for me to introduce Colonel Woodthorpe to you, because he is so extremely well known as an adventurous and very able surveyor and explorer. It must be now upwards of a quarter of a century ago since he surveyed the Nago and Garo hills, and published that charming account of the Lushai expedition, and since that geographers have watched his career, sometimes in the extreme East in Sadiya, sometimes attempting to solve the question of the Brahmaputra by ascending the Dipong, then in the Kuram field-force with Lord Roberts, again in the Pamirs, in Wakhan, with my old friend Sir William Lockhart, and again in his old ground Sadiya, and exploring the upper tributary of the Irawadi. Now at last, for the second time, I think, we have him with us in the flesh, and I am sure you will all give him a very hearty welcome.

After the reading of the paper, the following discussion took place:—

Sir RICHARD CAMPBELL STEWART: It is a great honour to me that the President should have called upon me to enter into the discussion this evening, for which I was scarcely prepared. I can, however, reflect the feelings of the audience here in having heard the interesting lecture from Colonel Woodthorpe. I have had the honour of meeting Colonel Woodthorpe in Burma, and on former occasions have heard of his very interesting explorations with other officers. I have had the opportunity of meeting a friend of Colonel Woodthorpe's on a former occasion of exploration, and I can only mention the extraordinary exertions of those officers who have made this most interesting exploration, and it must have been satisfactory to those with whom Colonel Woodthorpe served, to know that their explorations were of the greatest value to science and the country. In regard to these Shan States, on which Colonel Woodthorpe has given us so interesting a lecture, I can only say that I perfectly agree with him in all that he has said regarding their character and their interesting language. There is only one point on which I can say I am competent to judge, and that is as regards their qualifications and usefulness hereafter as soldiers in the army. It was said, during the time that I had the honour to command in Burma, that the Shans were not a fighting race. I can recollect, however, that the officer who commanded the Burma Sappers informed me that he was then enlisting many Shans, who were turning out excellent soldiers, and who had many military instincts, which he thought would be exceedingly valuable to the country hereafter. That is the only point upon which I think myself competent to form an opinion. If I may be allowed, I would say that Colonel Woodthorpe's explorations have been of the greatest value to science, and I am sure that you will acknowledge with me the pleasure we feel in the interesting lecture he has given us this evening.

The PRESIDENT: We are so fortunate as to have present here this evening a political officer in Mr. Scott, who is very intimately acquainted with these Shan States, and I therefore trust that he will favour the meeting with a few remarks.

Mr. J. G. SCOTT: Colonel Woodthorpe has charmed your eyes and your ears so completely to-night, and has given us so succinct, so general, and so comprehensive an account of the Shan States, that I feel myself rather in the position of the gentleman at the Mansion House, whose jokes had been used up in the speech before his, or of the young lady whose favourite song had just been sung by some

other young lady. It was, therefore, with some gratification that I discovered a mistake. It is not Colonel Woodthorpe's fault, and, moreover, the mistake is a very venial one. He states that the Muhso, one of these tribes whose names he rushed over—and they are not easily remembered—are so called because they are hunters. That is not exactly true. Muhso is not the Shan word for "hunter," although the idea is that Muhso does mean "hunter." Mokso is the Burmese word for "hunter," and the Burmese interpreters, who have to be used by most officers who have not time to learn Shan or Burmese, tell these officers that *muhso* means "hunter," and these people are hunters. As a matter of fact, they are very great at the crossbow, which they use with or without poisoned arrows. I remember on one occasion beating the jungle with a lot of these Muhso. We got nothing, because the jungle was too dense; so, when it was all over, we collected them, and held an archery meeting. We began at 22 paces, by getting these men to fire bamboo darts at eight-anna pieces; this was too expensive, and we reduced the mark to two-anna pieces, and then had some remarkable sport. I think you will find very few marksmen who would hit a two-anna piece at 22 paces with a revolver. Another point is, that it is hardly correct to say that during the Chinese New Year no one is allowed to go into their villages, because I have spent the whole of a Chinese New Year in the village of one of these chiefs. The Muhso chiefs are rather interesting, and the only personages I can compare them with are the Lamas of Tibet. The head-man of this particular village had to be worshipped during the New Year, and, unfortunately, we marched into the village on the eve of the New Year, so that he could only give me for political work, to discuss matters, what time he could spare from being worshipped. He would go to the population, who would come and offer up prayers, and then he would come over and discuss matters. During the New Year they behave much as the Chinese. They burn postal orders to the lower world, in the shape of slips of gold leaf, in the temple, fire off guns, and beat gongs. It is not that people are not allowed to go into the village on that occasion, but if they did it, they would soon leave, for what with the gongs, firing of guns, burning of crackers, and so forth, it is a noisy place to be in. There is a great number of other hill races among the Shan States, who are very interesting, and I hope some one will have the time to make a study of them.

The Shans themselves are well worth studying. Unfortunately, none of the officers there have had time to study their customs and habits. I may allude to one thing which seems interesting. They have a system of tenure which much resembles some of the feudal systems of tenure. For example, one very like socage—villagers holding land on condition of rendering some service to the sawbwa. In Ho Kut, for instance, they hold their lands free on condition of supplying the sawbwa with orchids. Another village of seventy or eighty houses had their lands free on condition of cutting grass for the sawbwa's ponies. Others came to look after the sawbwa's ponies. Then there was another case like petit sergeanty, villagers holding their lands on condition of supplying swords and gun-barrels. The Shan States grow a good deal of produce, which will become valuable. Perhaps you would like to know something of how the country is going to be opened up. A great deal has been talked about different lines of railway through the Shan States to Yunnan. I don't want to bore you, but the man who has been there is usually a great bore. We see an exception occasionally; Colonel Woodthorpe is a notable exception. I am the bore. The man who has not been there, or within 500 miles of there, and talks as if he had been there, is not only a bore, but a nuisance. We have been told that the Burma-Karenni railway is very feasible. Running up the banks of the Salwin to a point at the bend of the river about 19° N., the railway is supposed to get to the point

where the Nam Teng flows into the Nam Kong. It then follows the eastern bend, till, we are informed, it is only 40 miles to the Nam Kok flowing into the Mekong. In these days of photographing the money a man has or has not in his purse, it is difficult to say that anything is impossible; at any rate, this is too expensive to be done. There is a story I am fond of telling, I don't know whether you have heard it. It refers to the difficulties of the Shan roads. You have to climb up 4000 or 5000 or 6000 feet over what is like a ruin, and people going to the Shan States ought to be Alpine climbers. When first I went up with European soldiers, on getting to the top, one said, "Is this the Shan tableland, sir?" I said, "Yes." He said, "Well, then, we've been climbing up the blooming legs." The range is of the worst possible character of legs, and is 6000 feet high. In Europe tunnels would be driven through it; it is not likely with this railway, and it is absolutely unfeasible. With regard to the Kunlon line, it is asserted that at the Kunlon ferry the railway lands one in a *cul-de-sac* of the hills; this is absolutely inaccurate. When you get there, the country beyond is easier than before. It is practically absolutely certain that the railway can be taken on from the Kunlon ferry to Shunning-Fu, and from there it is nearly certain that the line can be carried down a stream to the Mekong, and from there again to Talifu, if the Chinese will allow it to be built. I am afraid I am wearying you, but I have only to regret that the picturesqueness of Colonel Woodthorpe's lecture has deprived me of much I should have liked to have said, and driven me to rather dull subjects.

The PRESIDENT: It only remains for us to thank Colonel Woodthorpe for having given us so interesting an account of the country, at present of extreme interest to Englishmen, and of which at present we know very little. We have also to thank Mr. Scott for the observations of great interest which he has made on the subject. We have had the very great advantage, not only of receiving this account from Colonel Woodthorpe, and his very full account of the manners and customs of the people, but we have to thank him also for the beautiful illustrations of his paper. I am quite sure you will all instruct me to return Colonel Woodthorpe our very cordial thanks for his paper.

THE WATERWAYS OF ENGLISH LAKELAND.*

By J. E. MARR. M.A., F.R.S., Sec. Geol. Soc.

I.—INTRODUCTION.

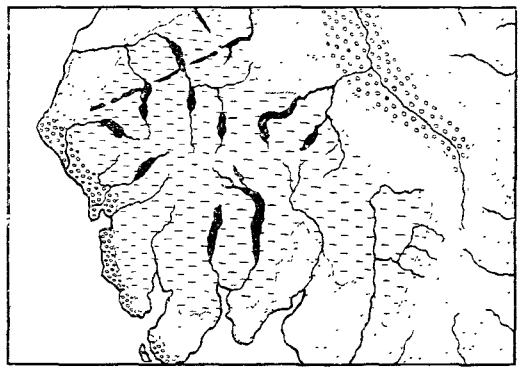
THE attention of geographers has recently been directed to the English Lake District by Dr. H. R. Mill, whose paper on a "Bathymetrical Survey of the English Lakes"† is valuable alike to the geographer and the geologist. In that paper the configuration of the district is briefly described, the radial symmetry of the stream-lines noticed, and the former existence of a vanished dome of rocks over the area maintained. The cause of the radial symmetry alluded to above has been discussed by many writers, but it will be convenient to add some further observations upon it in the present communication, which is

* Paper read at the Royal Geographical Society, March 23, 1896. Map, p. 688.

† *Geographical Journal*, vol. vi. pp. 46 and 135.

more especially devoted, however, to a discussion of the causes which have tended to produce deviations from the general symmetry of the stream-courses. A discussion of this character affords an excellent illustration of the manner in which study of stream-lines throws light on former events in the physical history of a country, and the results obtained from a limited district are applicable over much wider areas.

The earliest writer, so far as I am aware, who called attention to, and attempted to account for, the radial stream-system of Lakeland, was Mr. W. Hopkins.* He observed that the dip of the Carboniferous rocks, which form a broken girdle around the district, is sufficiently high to allow of their having risen far above the present surface, composed of pre-Carboniferous rocks; and gave reasons for supposing that



MAP OF THE LAKE DISTRICT, SHOWING RELATION OF RADIAL DRAINAGE TO GEOLOGICAL STRUCTURE.

PERMO-TRIASSIC ROCKS. CARBONIFEROUS ROCKS.

SILURIAN, ETC., ,, AXIS OF SILURIAN, ETC., ROCKS

they actually did extend over the earlier rocks, which had been folded and denuded before their deposition, and that the radial drainage was originally outwards in all directions from the centre of the somewhat irregular dome produced by the elevation of the Carboniferous rocks, though the radial cracks which he considered necessary to give the initial direction to the drainage were probably of little importance in that respect. The existence of Carboniferous rocks over the old slate rocks occupying the Lake District proper is also inferred by Mr. Aubrey Strahan,† on account of the trend of the rivers. He remarks that "at the time the rivers began to flow, the Carboniferous rocks extended up the whole platform, of which the present hills and watersheds form remnants, and that the courses down the slopes of these

* "On the Elevation and Denudation of the District of the Lakes of Cumberland and Westmoreland," *Quar. Jour. Geol Soc.*, vol. iv. p. 70.

† *Mem. Geol. Survey*, "The Geology of the Country around Kendal, Sedbergh, Bowness, and Tebay," by Messrs. Aveline, Hughes, and Strahan. 2nd edit., 1888, p. 2.

rocks, once initiated, were kept and deepened by the rivers, while the Carboniferous rocks were being denuded back into their existing scarped outcrop." The same reason for the radiate symmetry of the streams was given by the present writer,* in an article in which he suggested a cause for the formation of the dome, and a somewhat late date (geologically speaking) for its production. To these questions I would refer briefly here. The movements which produced the Pennine chain are generally admitted to have been in operation during the deposition of the New Red Sandstone rocks which occur in the Eden valley, which were deposited in a trough between the Pennine uplift to the east, and that of the Lake District area to the west. The latter, however, at this period does not seem to have been of such a nature as to produce a dome, but rather an anticlinal fold, continued in a northerly direction through Kirkcudbright and Ayr, having the northerly continuation of the Pennine fold running parallel with it to the estuary of the Clyde. Between these two anticlinal folds lies the Ayrshire coalfield, with the New Red Sandstone overlying it, and also the New Red Sandstone patches extending from the Eden valley up Nithsdale and Annandale. Passing to the east side of the Pennine chain, we find the Liassic rocks dipping eastward at such an angle that they ought to rise far above the Eden valley, and yet a patch of Lias (or more properly Rhætic) beds occurs near Carlisle, indicating subsequent movement about the position of the Pennine chain. Now, the Liassic beds of Britain were covered by a great thickness of Mesozoic sediments, so that the Rhætic deposits of the neighbourhood of Carlisle were probably covered by thousands of feet of Upper Mesozoic and possibly Early Tertiary strata. It is true that extensive movements of upheaval occurred in Britain in the early Cretaceous times, but we have reasons for supposing that Cretaceous rocks also extended over the area under consideration at one time. Moreover, the Lake District uplift is in the form of a dome, and regular dome-shaped uplifts, having a symmetry like that possessed by the Lake District dome, are produced, as far as we know with certainty, in one way only, by intrusion of a lenticular mass of igneous matter beneath, forming a laccolite.† Subsequent to the deposition of the New Red Sandstone of Britain, we have no evidence of intrusion of igneous rock until early Tertiary times, when the intrusions of plutonic rock occurred in Skye, Rum, Ardnamurchan, Mull, and Arran, *in a line which, if continued southwards, would pass beneath the Lake District.* The somewhat meagre evidence at our disposal points, therefore, to the possibility of the elevation of the Lake District dome having taken place during the middle Tertiary period of disturbances which produced such marked results

* *Geological Magazine*, December 3, vol. vi. (1889), p. 150.

† See Gilbert, 'Geology of the Henry Mountains.'

over a great part of Europe, and of the drainage having been impressed, not on Carboniferous rocks, but on overlying Mesozoic and perhaps Eocene rocks, which have been completely denuded from off the region around Lakeland, with the exception of the significant patch of Rhætic rocks near Carlisle. I have laid particular stress upon this point, because the occurrence of very old rocks in the heart of Lakeland and similar districts has often led geologists to assign a great antiquity to the river-systems of these districts; whereas, if the above inference be correct, the initiation of the drainage of the district is almost carried out of the domain of the geologist and into that of the geographer. There is nothing startling in the view that the Lakeland valleys have been entirely excavated in Tertiary times. The amount of denudation is quite insignificant when compared with that which has taken place amongst the basaltic plateaux of the western isles of Scotland.*

Whatever be the date of initiation of the drainage, and whatever the age of the rocks over which the waters first flowed, it seems to be generally admitted that this drainage was superimposed upon these once existent rocks, which have long since been denuded from the centre of the district, and that on this account the centre of radiation of the river-system has no connection with the axis of uplift of the Lower Palæozoic rocks which now occupy the Lake District proper, the former being indeed situated on the Scawfell group of hills, whilst the latter runs in an east-north-east to west-south-west direction through the Skiddaw group.†

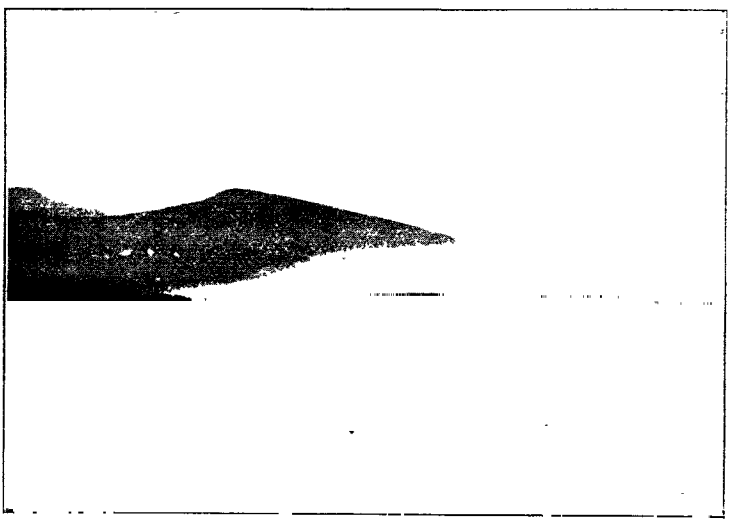
II.—The Initiation of the Lune and Eden.

As all the streams of the district flow into the sea or into the rivers Lune and Eden, we may conveniently consider the district for our present purpose as bounded by these physical features, and it is necessary, therefore, to discuss the origin of the two rivers mentioned above. As regards the Eden, though the actual river-valley is one of erosion by the river itself, the great depression between the northern half of the

* The Tertiary date of the final emergence of the Lake District has also been maintained by Mr. J. G. Goodchild (see *Transactions Cumb. and West. Assoc. for Advance of Lit. and Sci.*, 1888, p. 89).

† A good example of superimposed drainage in a district in which the overlying newer rocks have been almost but not quite removed by subsequent denudation, is furnished by the country around Prague. The Moldau here cuts right through the complicated basin of Lower Palæozoic rocks, which extend from Prague in a west-south-westerly direction, and many of its tributaries, such as the Beraun, have cut deep gorges into these rocks. Although these gorges are entirely cut into the old rocks, patches of Cretaceous rocks are found extensively on the plateau through which the rivers have eroded their valleys, and there is no doubt that the drainage of this part of the Moldau river-system was superimposed on late Mesozoic or Tertiary rocks. Had the Cretaceous rocks been entirely removed, there would be no indication of the (geologically) late date of formation of the valleys, and their nature might have led some to suppose that they were commenced at a very remote period.

Lake District and the Pennine chain forming the basin of the Eden, and spoken of conveniently by Mr. Goodchild as Edenside (the term "Eden valley" being retained for the actual valley of erosion of the Eden), is primarily due to Earth-movement having let down the soft New Red Sandstone rocks between the more durable Carboniferous rocks which bound them on either side, and the resulting greater denudation of the softer rocks.* The history of the Lune is different. Physically, the source of the Lune is that of the Birkbeck, which rises on the ridge



VIEW OF EDENSIDE, LOOKING TOWARDS WILDBOAR FELL AND THE HOWGELL FELLS FROM HIGH CUP VALLEY, NEAR APPLEBY. EDENSIDE IS DEFINED BY THE CLOUDS.

(*E. J. Garwood, photo.*)

of Shap Fells at a height of a little over 1000 feet above sea-level. This stream flows over carboniferous rocks for a distance of about 6 miles south through an open valley, and then enters a gorge at Tebay, with the high Howgill Fells rising on the east side, and fells almost as high on the west, both groups being composed of Lower Palæozoic rocks. The line of junction of the Carboniferous and Lower Palæozoic rocks at this place must have been far above that at the source of the Birkbeck, and there is little doubt that we are dealing with a case of what Gilbert terms "antecedent drainage;" in other words, that the uplift of the Howgill Fells took place after the initiation of the Lune drainage, but that the erosive power of the river was sufficient to keep the waterway open during the rise. This explanation of the Lune gorge is offered by Mr. Strahan. It is interesting to find a simple case, analogous to that which we are considering, described by Gilbert in his 'Geology of the

* The views illustrating this paper are from photographs by my friend E. J. Garwood, Esq., M.A., F.G.S., to whom I am indebted for permission to reproduce them.

Henry Mountains.' The laccolite called Mount Holmes consists of a "greater arch" and subsidiary "lesser arch" respectively, comparable to the Lake District dome and the Howgill Fells. "The crest of the greater arch is the centre of a radiating system, but the crest of the lesser arch is not; and waterways arising on the greater traverse the lesser from side to side. More than this, a waterway, after following the margin of the lesser arch, turns towards it and penetrates the flank of the arch for some distance. In a word, the drainage of the greater arch is consequent on the structure, while the drainage of the lesser arch is inconsequent.*

It will be evident to geologists that the uplift of the dome of the Howgill Fells was accompanied by the formation of the great "Dent fault," which runs to the east of these fells; and accordingly, if the Lune were initiated before the uplift of the Howgill dome, we should

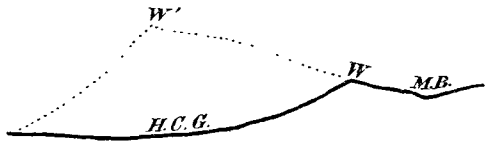


DIAGRAM-SECTION THROUGH HIGH CUP VALLEY. H.C.G. HIGH CUP GILL; M.B. MAIZE BECK; W. PRESENT WATERSHED; W'. ANCIENT DITTO. THE CONTINUOUS LINE SHOWS THE PRESENT SURFACE, THE DOTTED LINE THE ANCIENT ONE.

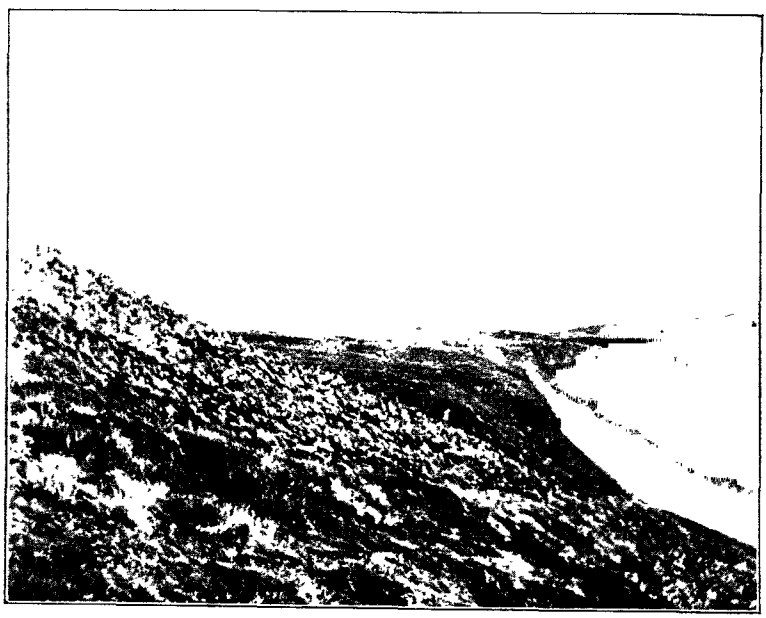
expect that some of its tributaries had commenced to flow before the final movements, at any rate, along the line of the Dent fault. Accordingly, Mr. A. Strahan, in the Memoir of the Geological Survey already quoted† (p. 2), remarks that "it may be supposed that those tributaries of the Lune which cross from the downthrow to the upthrow side of the great fault have retained and deepened valleys which were commenced before the fault existed, the erosion keeping pace with the upheaval on the upthrow side."

Before discussing the minor complications of the radial drainage of the Lake District, some of the complications of the Edenside waterways may also be noticed. The Pennine chain is a broken anticline, whose axis lies some way west of the present watershed. The watershed, as maintained by Goodchild, lay further west, and was probably originally over the axis of the uplift; but, as the anticline has a steep western and gentle eastern limb, this watershed would, according to the law of unequal slopes, gradually work eastward, with the result that the upper feeders of the Tees are gradually being "beheaded," and their headwaters diverted into the Edenside basin. An admirable example of this is seen in the case of High Cup Gill, east of Appleby.

* G. K. Gilbert, 'Geology of the Henry Mountains,' p 140.

† *Mem. Geol. Survey, loc. cit.*, p. 2

High Cup Gill runs at the bottom of a deep gorge cut through the Lower Carboniferous rocks and intrusive Whin Gill, to emerge into the wide depression of Edenside at the farm of Harbour Flat. On reaching High Cup Nick at the head of the valley, a gentle valley is found sloping down to Maize Beck, a tributary of the Tees, and a stream runs down here over a limestone, known as the Tyne bottom limestone. Looking westward, it is seen that this valley once extended considerably further to the west, its bottom there also being determined by the Tyne bottom limestone; but it has been cut into by the High Cup stream having a greater corrasive power, so that we find the westerly flowing



HEAD OF HIGH CUP GILL, SHOWING OLD VALLEY ONCE RUNNING TO MAIZE BECK CUT INTO BY HIGH CUP GILL (THE DISTANT MIST LIES ABOVE MAIZE BECK, THE NEAR MIST ON HIGH CUP GILL. BETWEEN THESE IS THE SURVIVING RELIC OF THE OLD VALLEY, PORTIONS OF WHICH ARE ALSO SEEN ON EACH SIDE OF THE HEAD OF HIGH CUP GILL, THOUGH COVERED BY LANDSLIP IN THE IMMEDIATE FOREGROUND).

(*E. J. Garwood, photo.*)

stream at the bottom of a gorge which has been cut out of the easterly sloping valley, the remnants of which are, however, easily detected. In time, the head of the High Cup valley will recede to Maize Beck, when this important stream will be diverted into the Eden drainage, as has already occurred to the minor runnels now flowing into High Cup gill.*

* A case where the head of an important stream has actually been diverted in this manner in the Lune basin has been described by Mr. Strahan (*Mem. Geol. Survey, loc. cit.*, p. 45). The head-waters of the stream flowing through Uldale in a northerly direction have been diverted to the west, owing "to the cutting-back action of the head-waters of Carling Gill."

The occurrence of gorges, presenting, on a small scale, the structure of cañons, the steepness of whose sides is clearly not due to small rainfall in this wet region, may be here noted. There are two well-marked types of gorge in Edenside; the first occur in the mountain-limestone



NUNNERY WALKS (A STEEP-SIDED RAVINE IN SOFT SANDSTONE).
(*E. J. Garwood, photo.*)

of the Pennine escarpment. A good example of this type is seen in Scordale, some 5 miles east of Appleby. This and similar gorges in the district owe their steepness to the prominent "master-joints" of the limestone, and also to the percolation of the rain into the porous limestone, the latter effect producing results similar to those which occur in

regions of slight rainfall. In the second type of gorge, well illustrated by the valley through which the Croglin water flows past Nunnery Walks between Armathwaite and Lazonby, the streams have eroded steep-walled valleys out of soft rock. The rock, a red sandstone, is far from durable, as shown by the projection of hard ribs to the extent of an inch and a half in places beyond the general level of the rock in the artificially cut caves of Eden Lacy, south of Kirkoswald, which were excavated between 1790 and 1836, indicating the destruction of at least an inch and a half of rock, mainly by wind, in a hundred years or less. The Croglin gorge apparently owes its steep sides to the increase in the declivity of the stream, produced by the comparatively rapid lowering of the bed of the main river, the Eden, which flows past the end of the gorge.*

The drainage-lines of the Eden and Lune valleys having been established, those of the central part of the Lake District were next developed, the streams of the east side of the district being then (as now) tributaries of the Eden and Lune respectively, whilst those of the west probably entered tributaries of the great subaerial valley which once occupied part of the site of the present Irish Sea west of the Isle of Man, as indicated by a continuous tract of deep water now occurring in that position.

III.—Initiation of the Radial Drainage and Early Changes.

The general drainage of the central part of the district having been impressed upon rocks which have since been denuded, it is only occasionally, and as the result of "accident," that the main valleys coincide with fractures of the strata. The independence of the major valleys and lines of fracture is well seen in the case of Windermere, across which the strata run with no break; while just west of the head of Windermere, an enormous fault is unaccompanied by any marked physical feature, it having only determined the trend of a minor cliff for a short distance, owing to the apposition of hard and soft rocks. Subsequent to the production of the radial system of stream-courses, and before the changes about to be described, there were probably several important changes; one, the uplift of the Howgill Fells, has already been mentioned, though, as it happens, no marked deviation in the direction of any part of the drainage resulted from it. Elsewhere it may have been different. The southerly flow of the Glenderamackin Beck towards the centre of the district is noticed by Dr. Mill, and I shall presently allude to the probability of the upper waters of the Caldew having once

* Similar cañon-like gorges in the heart of the Lake District, such as Peers Gill, near Wastdale Head, are noticed below. They are due to prominent joints, faults, and dykes of igneous rock traversing exceedingly durable volcanic rocks. It is interesting to find them close to Seathwaite, which bears an unenviable reputation for rainfall.

joined those of the Glenderamackin, thereby rendering this anomaly still more marked. Any one standing on the top of Mell Fell, which looks over the Glenderamackin and Caldew depression, will be at once impressed with the idea that at one time a valley ran from Mell Fell northwards towards the plain; and it is possible, at any rate, that the elevation of the Skiddaw, like that of the Howgill group, was posterior to the general uplift of the dome, but unlike the case of the Howgill Fells, that the Skiddaw uplift was sufficiently rapid to pond back the head-waters of the old valley and divert them southward, producing a watershed to the west of Carrock Fell.* Other minor changes may have occurred in pre-glacial times, but they have not been sufficient to complicate the general radial symmetry to any great extent, unless the origin of the Ullswater drainage far east of that of most of the main valleys be due to beheading of its upper portion (for it is possible that the waters of the upper part of the Wythburn valley, when at a higher level, may have flowed through the depression between Helvellyn and Fairfield, and so down the Grizedale valley to Ullswater); but it is more probable, as suggested by Hopkins, that this want of symmetry is due to the original want of symmetry of the dome, which was continued eastward as an anticlinal fold running past Shap Fells.

IV.—Establishment of Fault Valleys.

Though the directions of the main streams are not due to the geological structure of the rocks over which they now run, those of some of their major tributaries are undoubtedly so due. In some cases simple faults have acted as planes of weakness, along which the streams have worn valleys; but the most interesting examples of tributary valleys along fault-lines are not formed along single fractures, but along a complex of faults, and as I have not been able to find any description of valleys of this character, I wish to call special attention to them. The best illustration of the type is the Vale of Troutbeck, which joins the Windermere valley a little north of Bowness. It has long been known that the beds are displaced by faulting along the line of this valley; but detailed mapping of thin bands of strata shows that the disturbance is not a simple fracture, but a series of faults of varying size, causing the division of the beds into a series of large blocks. In the accompanying section of an easily recognized band, the Coniston Limestone is shown crossing the Troutbeck valley. Five faults are represented, but the largest and most easterly one is not necessarily a simple fracture as here indicated, for the bottom of the valley is extensively occupied by superficial accumulations, so that detailed

* In connection with this, it may be noted that the age of the intrusive rocks of Carrock Fell has never been determined, and that they strikingly resemble certain igneous rocks of Tertiary age in Scotland.

mapping is there impossible. Only the large faults are represented; there are many smaller ones which cannot be represented on the scale of the map. On either side of the valley the limestone runs with greater regularity to Windermere on the one hand, and over the ridge into Kentmere on the other. The bottom of the Kentmere valley is also occupied by numerous faults of a nature similar to those of Troutbeck, and the same is probably the case in the parallel valley of Long Sleddale, though the bottom of that valley is so largely occupied by drift deposits, that little can be seen.

A peculiar set of movements, the cause of which it is not our province to discuss here, has produced a number of belts of broken rock, running in a general north and south direction in the district east of

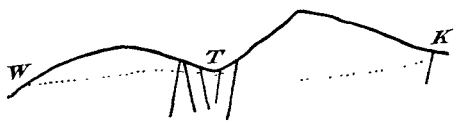


DIAGRAM-SECTION FROM WINDERMERE (W.) ACROSS TROUTBECK (T.) TO KENTMERE (K.), SHOWING FAULTS IN CONISTON LIMESTONE.

.... CONISTON LIMESTONE. /\ FAULTS.

Windermere, and constituting what geologists term a fault-breccia on a very large scale. Along these belts denudation has operated, causing the prominent north and south valleys, such as Troutbeck, Kentmere, and probably Long Sleddale, while the intervening belts of unbroken rock have resisted denudation, and consequently stand up as ridges separating these valleys. Detection of fault-complexes of the character described above is difficult, except under the conditions occurring in Troutbeck and Kentmere, where several easily identified beds of different character and of no great thickness cross the valley. Amongst the very puzzling volcanic rocks which constitute the most picturesque part of the district, the occurrence of these shattered belts is not so easily recognized; but, as the result of many years of observation, I am led to believe that many of the minor valleys of the volcanic tract (occupied by what geologists term the Borrowdale Series) have been formed along belts of broken rock, and not along simple fractures. The cleft of Dummail Raise and the valleys of Thirlmere and Grasmere which run north and south from that cleft are apparently due to a belt of shattered rock of the character described above.*

* A somewhat similar rock-structure occurs in, and is largely responsible for the origin of, the Christiania fjord, though in that case softer rocks have been let down amongst harder ones (see W. C. Brögger, "Ueber die Bildungsgeschichte des Kristiania-fjords," *Nyt Magazin for Naturvidenskaberne*, 30ter Bd (1888), p. 99).

V.—Strike-Valleys.

Valleys formed by denudation along softer rocks intercalated between harder strata occur as tributaries to the main valleys, and also to the larger tributaries described above, and may therefore be noticed next in order. The best marked strike-valleys are those formed along the soft graptolite-bearing "Skelgill beds," which are intercalated between the harder Coniston limestone series below and "Browgill beds" above. Passing from east to west, we find a small depression running all along the outcrop of these beds from Shap to Millom, and as the strike of the beds is east-north-east to west-south-west between Shap and Coniston, and north-east and south-west between Coniston and Millom, the streams also flow in those directions. Wastdale Beck flows towards the east-north-east to Shap Wells, where it joins the Birkbeck; Browgill flows to the west-south-west to join Stockdale, a tributary of Long Sleddale; Skelgill (= Holbeck Gill) flows from the heights above Low Wood to join Windermere near the Low Wood Hotel; Pull Beck flows east-north-east to the west shore of Windermere; Mealy Gill, having a north-east course, joins Church Beck, Coniston; and the most important of all the strike-streams flowing along the Skelgill Beds, Appletreeworth Beck, rises on the moorland west of Coniston, and flows in a south-west direction past Broughton Mills.

A strike-valley of considerable importance occurs between Scales and Keswick, and is occupied by the lower waters of the Glenderamackin and by the Greta. The streams run along soft shales of the Skiddaw slate series lying between the hard Skiddaw beds to the north and the harder rocks of the Borrowdale Series to the south.

Closely related to these strike-valleys are the valleys which occur between the Lower Palæozoic rocks and the Carboniferous rocks, and indeed they are parallel to the strike of the latter. Several important valleys occur in this position; I may mention the Lowther, north of Shap, and especially the head-waters of the Lune, north of the Howgill Fells. I have already stated that, physically, the Lune rises on Shap Fells. Its actual source is now about Ravenstonedale, and there is little doubt that this portion, once an insignificant tributary of the original river (which it joins at Tebay), has gradually worked its way backwards along the line of junction of Lower Palæozoic and Carboniferous deposits until it has reached its present position.

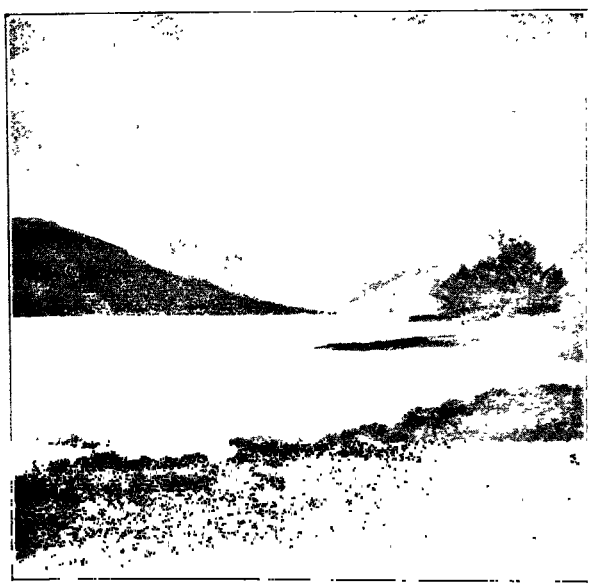
I have treated of the strike-valleys as formed after the fault-valleys of Troutbeck, Kentmere, etc., because some of them, as above seen, are tributary to those valleys; but other strike-valleys may have been initiated simultaneously with them, or even before them.

VI.—Changes produced during the Glacial Period.

That the most important valleys described hitherto were formed before the Glacial Period is shown by the existence of glacial relics

within them. We have now to consider the changes produced during this period. Many of the changes recorded above have resulted in the production of tributaries of the radial drainage-lines, which have not disturbed the symmetry of the drainage; but the changes about to be considered have produced marked complications, though, as they are on a small scale when compared with the river-systems as a whole, the general symmetry of the drainage-lines still remains obvious.

The deviations of stream-courses produced in Glacial times were due to the blocking of valleys by drift * (or, rarely, by ice) to a height



HAWESWATER FROM MEASAND. A TYPICAL VALLEY-LAKE.
(*E. J. Garwood, photo.*)

above that of a point on the watershed which separated the blocked-up valley from an adjoining one. In such cases the waters were ponded up in the valley until they reached the height of the col, forming a pond or lake, the permanence of which depended largely on its size. In two recent papers read before the Geological Society,† I explained the existence of a large number of the tarns of Lakeland as due to this cause; and in a communication read before the Geologists' Association,‡ I have endeavoured to show that the larger lakes of Lakeland were produced in the same way, and were not formed by erosion of rock-basins by ice. The latter conclusion is largely based upon the very

* I use the term "drift" vaguely to signify the detrital material which was deposited by the agency of ice during the Glacial Period.

† *Quar. Jour. Geol. Soc.*, vol. li. p. 35. and vol. lii. p. 12.

‡ In January, 1896; not yet published.

valuable series of facts recorded by Dr. H. R. Mill, which appear to me to be absolutely inexplicable on the ice-erosion hypothesis; and we are driven to conclude that the lakes were formed either by stoppage of valleys by drift, or by differential movement of the Earth's crust, causing the formation of barriers across the valleys. In the paper cited, I have given reasons for rejecting the latter explanation and adopting the former.

The map appended to the paper shows the principal changes which occurred in the drainage in glacial times, some of which I have described elsewhere. It will be convenient to begin at the north-east margin of the district, and to notice the various cases of deviation of drainage-lines as one travels round.

I have elsewhere* given reasons for believing that Mosedale,† west of Shap Wells, once drained into Wet Sleddale, and by the formation of a drift-barrier was diverted into Swindale. Proceeding to the north, the Eamont, coming from Ullswater, flows over drift to near its junction with the Eden, when the old drift-filled valley runs somewhat north of the Eamont past Edenhall. Ullswater appears to have resulted from this drift-dam, but the drainage of the higher part of the Eamont is still along the old course, though the lower course of the Eamont, or of the Eden below its junction, has probably been altered to a considerable extent. The next diversion of drainage is in the valley, already alluded to more than once, lying between Saddleback and Carrock Fell to the west, and the high ground around Greystoke to the east. It will be remembered that I suggested that at one time a stream ran from the neighbourhood of Mell Fell northwards to Carlisle, occupying the present valley of the Caldew along the lower part of its course. The first change in the direction of the drainage of this tract was stated to be due possibly to the uplift of the Skiddaw-Saddleback group, causing the formation of a watershed east of Carrock Fell, and allowing the water to flow southwards from thence, through the Glenderamackin valley towards Keswick. At a later period Swinescales Beck, flowing into the Eamont, may have captured the upper waters of Troutbeck, or Troutbeck may have originally flowed into the Eamont. In Glacial times, as I have elsewhere argued,‡ a drift-dam separated the Troutbeck stream from Swinescales Beck and diverted it into the Glenderamackin, whilst another dam of drift near the hamlet of Mungrisdale caused the beheading of the Glenderamackin, and turned its former upper waters into the Caldew drainage.

Two important valleys, the vale of St. John and the Naddle valley,

* *Geological Magazine*, Decade IV. vol. i. p. 539.

† The district abounds in valleys having this name. It appears to be a corruption of Mossdale, and therefore is specially applicable to many drift-filled valleys in which changes of the nature which I am describing have occurred.

‡ *Geological Magazine*, Decade IV. vol. ii. p. 299.

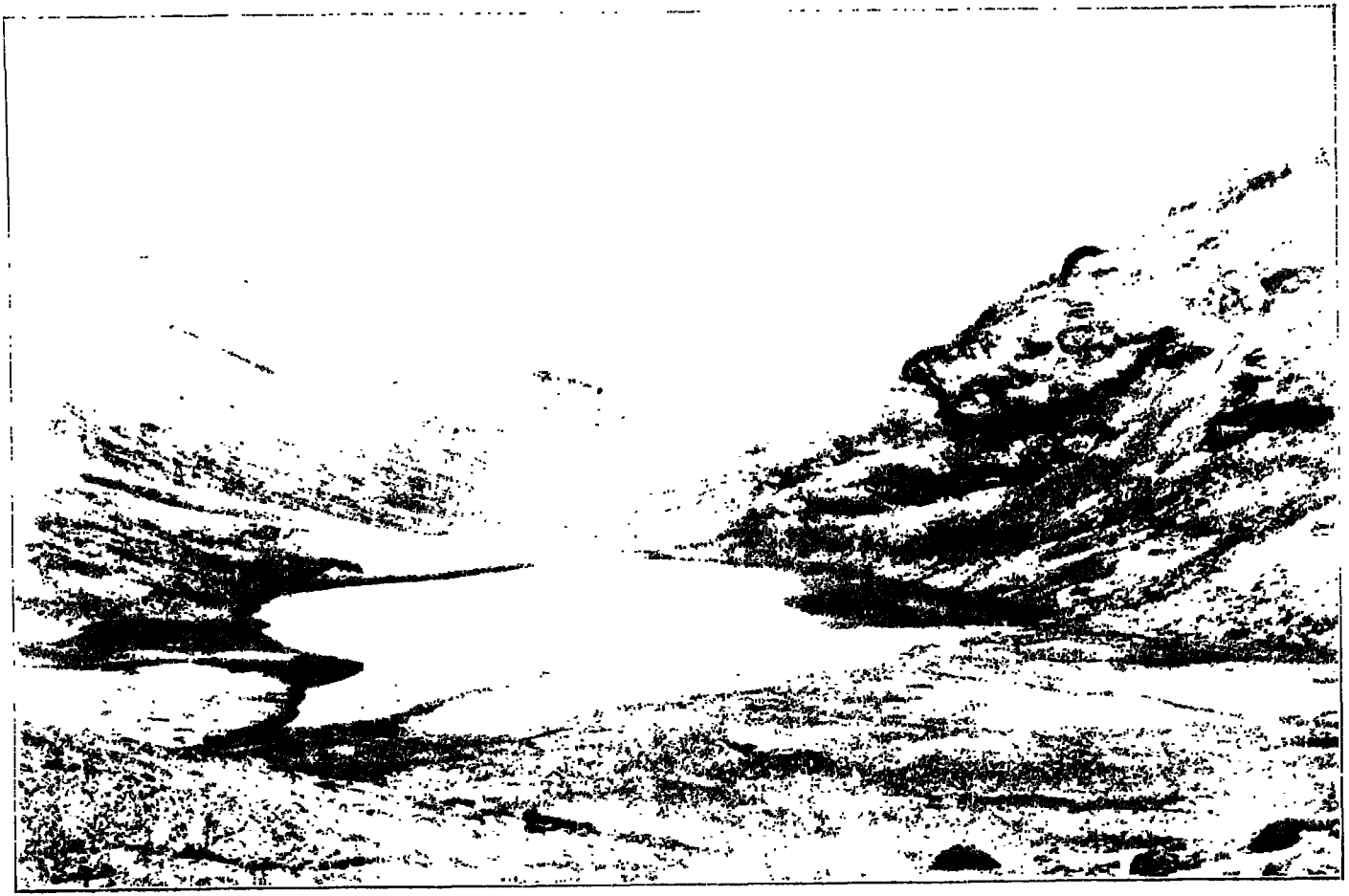
come from the south, and open into the Greta valley east of Keswick. The former vale receives the waters from Thirlmere, and I have given reasons for supposing that the drainage of the Thirlmere valley formerly flowed through that of the Naddle, and that, by the blocking of this valley by drift, the waters were diverted into the vale of St. John, and Thirlmere formed.

Passing into the main valley in which Derwentwater and Bassenthwaite are situated, we have an example of a minor deviation of a stream-course in Borrowdale. I have given reasons for supposing that the Watendlath valley once turned sharply to the west to join Borrowdale near Rosthwaite,* and that when the gorge was blocked by drift, the drainage was diverted into another small valley, through which it now flows to Lowdore.

What occurred at Watendlath on a small scale seems to have taken place on a much larger one at the foot of Bassenthwaite; the main drainage of the Derwent probably ran through the important Embleton valley at one time, and when this became blocked by drift, the drainage was diverted, and flowed over a low col at the present foot of Bassenthwaite, giving rise to the lakes of Bassenthwaite and Derwentwater, or rather to the lake from which these have been formed. Before leaving Borrowdale, mention must be made of some of the minor diversions caused by the formation of drift-dams. Some of these, as Sty Head Tarn and the Langstrath alluvial plain, have been mentioned in my paper on the "Tarns of Lakeland." The term "drift-dam" should hardly be applied to the former, as the obstruction is in reality a dry delta, as described in my former paper, and the tarn may be quite modern, for the dry delta was probably produced by a "cloud-burst" of the same nature as those noticed later. The Langstrath alluvial flat deserves more notice than that which it received in my former paper, where I stated that "a deep narrow gorge through rock at the lower end (of the alluvial flat) has drained the old lake, which was probably ponded up by the mass of moraine material lying west of the gorge and blocking the valley." As a matter of fact, the course of the old stream can be seen below the above-mentioned mass of moraine material. The gorge itself, which is post-Glacial, is of some length, and very deep as compared with its width, and, owing to the accumulation of stones at its lower end, the water in it is particularly deep. Every one walking up the Langstrath valley should turn aside 50 yards from the path, shortly after passing a huge detached block of rock just above the path.

I also noticed a mass of drift at the foot of the Rosthwaite alluvial plain, which "probably once extended across the Borrowdale valley and caused a lake, which was drained by the stream cutting through the drift." I have further to mention two other drift-ridges, each of which

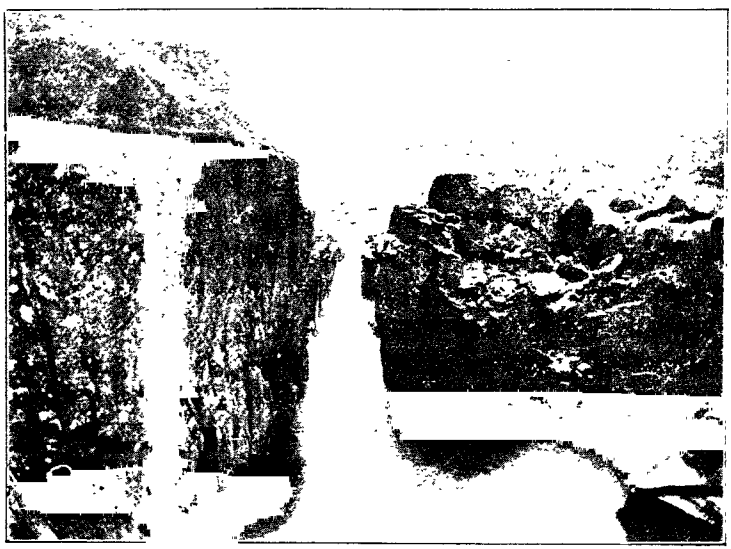
* *Quar. Jour. Geol. Soc.*, vol. lii.



STY HEAD TARN, LOOKING TOWARDS THE OUTLET. A TARN FORMED BY DIVERSION OF A STREAM OWING TO A DELTA. THE ORIGINAL STREAM RAN BELOW THE SITE OF THE DISTANT DELTA TO THE LEFT OF THE PRESENT EXIT. THE DELTA IN THE FOREGROUND, AND THE COMPLEX ONE ON THE LEFT HAND, ARE NOW FILLING UP THE LAKE.

(E. J. Garwood, photo.)

once formed a lake now marked by an alluvial flat. The larger starts at the end of the ridge separating the Stonethwaite and Comb Gill valleys, and, curving round to Rosthwaite village (where it is plastered against the roches moutonnées which rise up in the village), is cut through by the stream which passes the hotels. The smaller crosses the Seathwaite valley just above Seatoller, and once caused a tarn between the hamlets of Seatoller and Seathwaite.



ALLUVIAL FLAT IN STONETHWAITE, WITH GORGE IN FOREGROUND. THE ORIGINAL STREAM, NOW DRIFT-DAMMED, RAN CONSIDERABLY TO THE RIGHT OF THE PICTURE.
(*E. J. Garwood, photo.*)

The next valley-system contains Buttermere, Crummock, and Loweswater. The origin of Crummock and Buttermere appears to have been similar to that of Bassenthwaite and Derwentwater, though in the case of Crummock the old drift-filled valley probably lies on the east side of Crummock, whereas that of Bassenthwaite is situated on the west side of that lake.

Loweswater is particularly interesting. As Dr. Mill remarks, the valley containing it is one of two important valleys in which the streams flow towards the heart of the district, the other being that of Glenderamackin. The direction of flow of the stream from Loweswater, however, appears to be due to the blocking of the former valley, which occupied the sites of Mosedale (south of Loweswater), Loweswater itself, and the Marron river, by drift at Waterend, near the head of Loweswater, thus forming the lake, and reversing the direction of the drainage south of the barrier.

Ennerdale lake is also apparently due to a drift-filled valley, the

waters of which probably ran west towards Whitehaven or St. Bees. When the drift-dam was formed, the Ehen was diverted southwards to Sellafield, and the Ennerdale lake came into existence.

The drainage of the Bleng and Irt is also very interesting. The Bleng flows south-west to Gosforth, then turns almost to the north-east towards Strands, below which it is joined by the Irt flowing from Wastwater, and the combined streams flow south-west from Santon bridge to Drigg. At one time the Bleng probably flowed from Gosforth to Seascale, and was joined by the Irt. A drift-barrier below Gosforth diverted its waters along the lower part of what was then the Irt, but in an opposite direction to that in which the Irt was flowing. In the mean time another drift-dam, west of the lower part of what is now Wastwater lake, formed the lake, and caused its waters to flow for some distance to the south-east of the original course of the Irt, until they united with the diverted stream of the Bleng and flowed together from Santon bridge, along what was once a valley occupied by a minor stream.

Two interesting cases of diversion occur near Eskdale, both of which are described in my paper on the "Tarns of Lakeland." The stream from the upper part of Miterdale has been diverted into Eskdale, causing the formation of Burnmoor tarn; and the upper part of the Black Beck, occupying the valley in which Waberthwaite is situated, has also been diverted into Eskdale, with the formation of Devoke Water. This case is of interest as forming, perhaps, the best link between the tarn and the valley-lake. The following show a gradual passage from the tarn at one extreme to the valley-lake at the other: Easedale Tarn, Hayeswater, Burnmoor Tarn, Devoke Water, Rydal, Grasmere, Thirlmere.

The last and perhaps the most striking case of diversion to be noticed occurs at the foot of Windermere. The Windermere valley is continued in the same line by the important Cartmel valley, now occupied by an insignificant stream, whilst the present drainage of Windermere through the narrow Leven gorge looks most unnatural. The col between Windermere and the Cartmel valley and the bottom of the Cartmel valley are covered by drift; and it seems evident, when one is on the spot, that the Windermere drainage once ran down past Cartmel, and when this valley was blocked by drift, the drainage was diverted into the Leven gorge, and the lake formed.*

Other minor cases of divergence of stream-lines will, no doubt, be detected, but I have given enough examples to show that very considerable modifications of the drainage-lines of the district have been produced owing to the formation of drift-dams. Such dams have probably played a most important part in modifying drainage of other

* In the paper read before the Geologists' Association, an example of a valley in Furness, filled with drift to many hundred feet below sea-level, is cited. There is, therefore, no difficulty in accounting for lakes like Windermere, the lower parts of which are below sea-level, by supposing that they are drift-dammed.

areas. Professor W. M. Davis, for instance, remarks of the Yorkshire Derwent, "The peculiar position of the head of the subsequent Derwent, close to the sea, suggests some glacial interference with normal adjustments, and calls for special explanation." *

VII.—Formation of Post-Glacial Gorges.

In the region around Scawfell, where the rocks are hard and well jointed, we find every gradation, from the "rake" or "couloir" running down the side of the hills to the larger tributary valleys, and it is easily seen that the rakes, and most of the smaller valleys, owe their position to the occurrence of planes of weakness, which are either "master-joints," faults (often filled with breccia), or dykes of igneous rocks, which weather more rapidly than the rocks into which they are intruded. Clifton Ward long ago pointed out that the chasm of Mickledore is due to a dyke, and it is only one of many scarring the sides of the Scawfell group.

The Peers' Gill ravine is a particularly good example of a gorge formed along a line of weakness, or rather two sets of such lines crossing each other at right angles. When viewed from the top of the Sty Head pass, it is seen to have a Z-like course (the limbs of the Z being at right angles to the main line); and a number of tributaries which enter it also cut along the set of planes of weakness, which run at right angles to the most prominent part of the gill, namely, that descending Lingmell, and exactly facing the top of the Sty Head pass. Some of these rakes and minor valleys were no doubt initiated in pre-Glacial times, but we have evidence that others are much more recent. Strahan † notes that "a great mass of *débris* was washed down from the sides of Blease Fell, on the east of Lune, about 2 miles south of Tebay junction, in the course of three or four hours during a thunderstorm, about the year 1858. The rain excavated deep channels in the weathered rock of the hillside, and spread the rubbish over some pasture-land below. The *débris* still forms a striking object as seen from the train." The depth of parts of these channels approaches 20 feet. Similar effects must frequently have been produced as the results of such "cloud-bursts." Gilpin ‡ describes the occurrence of a cloud-burst on Grasmer (Grasmoor) on September 9, 1760, which brought down a vast amount of material. It was computed that the stream must have been 5 or 6 yards deep and nearly 100 broad. This same writer describes a similar occurrence in the Vale of St. John on August 22, 1749, "which

* *Geographical Journal*, vol. v. (1895), p. 143.

† *Mem. Geol. Survey*, "The Geology of the Country around Kendal," etc., p. 51.

‡ Gilpin, 'Observations on the Mountains and Lakes of Cumberland and Westmoreland,' vol. ii. pp. 4, 36. See also West, 'Guide to the Lakes,' 10th edit., p. 138, *footnote*.

forced a new channel through a solid rock, . . . and made a chasm at least 10 feet wide."

An interesting gully is seen somewhat north of the top of High Street, where, as seen on the 6-inch Ordnance map, the Roman Road is partially destroyed by a ravine which has cut through it. The head of the ravine is a few yards above the road, and where it cuts the road it is about 18 feet deep and 103 feet across at the top. It is excavated partly in loose rubble, but largely through rock *in situ*, though much affected by weathering. Some of the material may have been removed by landslip, but the greater part was probably disintegrated by running water, which has also removed it. Thus—

> "The massy ways, carried along these heights
> By Roman perseverance, are destroyed,"

and indications furnished of the amount of denudation which takes place under present conditions during periods of exceptional rainfall.

In a paper published in 'Natural Science,' * I called attention to the admirable examples of stream-erosion curves seen amongst the hills of Lakeland. They are seen to perfection when the bare rock extends to the summit of the hills. In other cases the curve is not steepest at the summit of the hill, but becomes gradually gentler at a varying distance from the top. In all of these cases the change in the character of the curve occurs, so far as I have observed, when bare rock is replaced by peaty covering, which frequently masks the rocks on many of the high hills (as in the case of all the Howgill Fells, also on the Thirlmere side of Helvellyn, on High Street, and indeed on the greater number of the fells). The shape of these peat-covered upper portions seems to be due to weathering unaccompanied by stream-transport and stream corrasion, and accordingly we get the characteristic spheroidal (in this case hemispheroidal) outline on a large scale (frequently seen on a small scale in granite tors), which is largely due to the greater action of the weather along well-marked divisional planes than elsewhere, causing the gradual conversion of a cubic into a spheroidal body.†

I have indicated what I believe to be the principal points in the history of the Lake District drainage. The minor changes are more readily ascertainable here than in other places, owing to the extreme simplicity and regularity of the initial drainage-lines. Insignificant as many of these changes are, it may be useful to notice them, as attention may thereby be called to changes of more importance and on a larger scale elsewhere; and, furthermore, I believe that their record will enhance the pleasure of the increasing number of people who journey to Lakeland with a desire to know the meaning of the physical features of that lovely district.

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* *Natural Science*, 1895, p. 240.

† See also F. Rutley, "On the Dwindling and Disappearance of Limestones," *Quar. Jour. Geo. Soc.* vol. xlix. p. 372, pl. xviii.

Before the reading of the paper, the PRESIDENT said: We had last year evidence given us of the great interest and instruction we may derive from the study of English geography, when we listened to the paper communicated to us by Dr. Mill on the English lakes. We now have with us Mr. Marr, secretary of the Geological Society, and I am sure his account of the drainage of Lakeland will be equally interesting. I now call on Mr. Marr to address the meeting.

After the reading of the paper, the following discussion took place:—

Mr. W. T. BLANFORD: I can only say I have listened with very great attention and pleasure, as I am sure everybody else has, to the description Mr. Marr has given of this interesting country. There is no subject more worthy the attention of a geographical society than the origin of hills and valleys, and these are exceedingly well marked in a tract of country of this kind. The history of river valleys is one of the questions of modern geology, a question which has arisen within my recollection, and which was almost ignored by many of the great geologists fifty years ago. When it was first pointed out by certain geologists, amongst them Jukes, that river valleys are of great antiquity, the idea was looked upon as almost heretical. Rivers are of very ancient origin; in many cases they are older than the mountains they traverse. All sorts of explanations have been adopted for the fact that a great many rivers run across mountains from side to side, and there is no doubt that all sorts of explanations may be necessary, because the fact is an extraordinary one. A very simple explanation, but a most obvious one when fully conceived, is the simple fact that the river existed before the mountains, and, as elevation gradually took place, the river kept its way, cutting through the mountains. Two of the most extraordinary cases known are those of the Indus and Brahmaputra, cutting through the Himalayas, and actually running from one side to the other of the biggest mountains in the world, and that this is so is probably due to the fact that the rivers were there before the mountains existed. When one once gets this idea of the enormous power of a river, its history becomes a question of great geographical importance. I think that, as a contribution to the history of rivers, Mr. Marr's paper is of particular interest, because he shows not only how the rivers make their valleys, but also how rivers change their courses, how a river forms itself into a lake and runs out again at the other end; and he describes the evidence of other changes that have taken place in the country, some of the most important being those due to the glacial period, to which geologists and geographers look back as an explanation of extraordinary phenomena, some of the deductions being rather extravagant. After the care Mr. Marr has brought to bear upon the examination of the distribution of streams and valleys in Lake-land, there is no doubt that the result has been of much importance, and I can only say, with regard to the interest of Mr. Marr's researches, that in one or two cases where I once thought that lake-basins were produced by distinct glacial erosions, he has found the features to be due to other causes. I believe there is no point of geographical interest of more importance than the careful examination of the features of a district in order to trace out the causes of their origin and formation.

Dr. H. WOODWARD: I came here to listen and learn, and I have been greatly interested in Mr. Marr's paper. I think we have heard something of the views Mr. Marr has given us to-night before, with regard to the formation of the small lakelets in lakeland. I must say that his application of Gilbert's view, with regard to the elevation of the central mass of the Lake District, is one which must strike geographers as of very great interest, showing that the features of the country have not been made by ice, but by those great physical alterations in the level and geographical and geological structure of the country which have been impressed upon the land at an earlier time. One of the things that strikes one

most is the way in which rivers have continued to hold certain directions through great changes in the denudation of the country; and one would almost compare this change in the Lake District to a very interesting experiment which was shown by Professors Ayrton and Perry some years ago at the Royal Society with regard to the magic mirrors of Japan, which have been impressed on the back with a series of ornamental patterns, while the front has been polished for the ladies of Japan to admire their faces. When held at a certain angle with the beams of the sun, the workmanship at the back can be reflected from the face of the mirror upon a screen. Now, these great changes effected in the removal of the surface layers from the Lake District seem to have been unable, after all, to force the rivers entirely out of their original courses; for, although great masses have been removed, the rivers have held on their original courses, save where at later times glacial drifts have blocked these river-courses, and in some cases deflected them from their original channels. I cannot help thinking that we have learned from Mr. Marr a most useful geological lesson, which a great many Fellows of this Society must have enjoyed as much as I have.

Mr. Aubrey Strahan: I have listened with very great interest to this paper by Mr. Marr. Mr. Marr has not only an intimate knowledge of the district, but I am glad to see he has also an equally intimate knowledge of the literature connected with it. It is not everybody who reads the official publications of the Geological Survey, or makes much use of them, and it is satisfactory to find that somebody gains something by them of any use. This is undoubtedly a very fine district; but, unfortunately for a number of questions, the evidence is rather meagre. We know perfectly well that the country was buried and dug out again by denudation time after time; but the denudations have been so complete, that some of the later formations have been clean swept away, and have left no trace to show how far they extended over the district. I don't know that Mr. Marr himself is able to produce any evidence that the Oolites and the Cretaceous rocks extended over the district; yet our knowledge of the initiation of the river system rather depends on our knowing what formations covered these mountains. The Dent fault, to which he alluded, is an extraordinary example of the denudation being kept up with by the river. A fault of that description, if it came into existence suddenly, would produce a vertical cliff of something between 1500 and 2000 feet high, a crack going down we know not how far. Notwithstanding this, there is not a sign of its presence on the surface of the ground, except a feature due to a hard rock on one side, and a soft on the other. There are plenty of such faults through the country, many of greater size. The upthrow of the fault is absolutely unrepresented by any change of level in the ground, except that due to the hardness of the rock. Now, of these rivers, one coming down Garsdale flows from the lower side of the fault, and right across it on to the ground uplifted. There seems an explanation of this, and that is the one Mr. Marr gave. The fault came into existence after the river had established its course, and a general denudation of the ground kept the surface level in spite of the fracture. Mr. Marr attributes a very late date, later than most others have attributed, to the drainage system, and in this I am disposed to agree with him entirely. It is no new thing that enormous denudation has taken place in what we geologists speak of as a comparatively recent period, the post-Tertiary or Tertiary. As examples, take the rivers Thames and Frome; their valleys we know are post-Tertiary. Between the rivers is a structural arch, from the crest of which run the tributaries to the main streams. It is true that the arch between them is only partially perfect. In Salisbury Plain and round Basingstoke it still retains its crest, but further east there are only the foundations from which the walls sprang, namely, the North and South

Downs. The crest of the arch itself lay in what is now the valley of the Weald; but the rivers have kept their old courses, and, flowing north and south straight at the ramparts of chalk, penetrate these, and get through to the sea. Still further south there is another water-parting of exactly the same character; but there exist only the headwaters of the streams that flowed from that parting. The sea has swept the whole of that further river-basin away. There are other examples in some of the hill districts in North Wales, the Lake District, and Scotland, to which I would call Mr. Marr's attention—abandoned valleys which seem to have no meaning in them, which carry no water, and serve no purpose. I suggest that it is possible that they represent the remnants of a very ancient drainage system, which has been abolished and replaced by a more recent system, such as that which Mr. Marr has described. In conclusion, I wish to express my gratification at having had the opportunity of hearing this excellent paper.

Dr. H. R. Mill: When, a short time ago, Professor Milne spoke of the hills nodding their heads to one another, and showed us the Earth's crust in a state of continual tremor, it may be that some of those who hold that this Society is concerned mainly with the exploration of foreign lands, thought that a practical joke had been played upon them. To-night it must have struck some, when Mr. Marr described rivers wandering over the country, and valleys working backwards to behead and capture the water of other rivers, that the land is in a very much less stable condition than they had been in the habit of thinking. The surveyor measures the land as he finds it at the moment of survey, and the cartographer maps it, but when a geographer begins to describe the physical features of the land surface, he finds it absolutely necessary to give a reason for the arrangement of these features; and Mr. Marr has shown, for the first time at an evening meeting of this Society, how these features came into existence, according to certain well-defined and perfectly ascertainable laws. In America Professor W. Morris Davis, and in France Professor de Lapparent, have elaborated a method of studying these phenomena of dynamic geography, as we might call it, and I am pleased to see that Mr. Marr, while acting independently in the same direction as these gentlemen, has, for purposes of popular description, avoided their terminology. In its proper place, the theoretical elucidation of practical problems, a precise terminology is essential, and in introducing one for such purposes Professor Davis has rendered an inestimable service. I am personally gratified that Mr. Marr found the work which the generosity of this Society and the help of Mr. Heawood enabled me to do, of service to him; and we must all congratulate ourselves that in our own country there still remain districts which can be studied with results so interesting and novel. I have lately revived an old idea that a geographical memoir of the whole country ought to be compiled. I was interested to hear Mr. Strahan say that the geological memoirs had grown. I wish I knew the particular agricultural operations necessary to ensure such growth, for I would like to apply the same principles of culture to a memoir of the Ordnance Survey, which should enable us to further the study of the influence these various land-forms had upon the different conditions of the district, on the plant life, the animal life, and the life and movements of man himself. That is the real end of geography, to elucidate the relation of man to the Earth. Dr. Haviland has gone into many of the conditions of human life brought about by these very river systems, mountains, hills, and watersheds of the region of which Mr. Marr has been speaking. We are extremely indebted to Mr. Marr, an accomplished geologist who has thrown so much light on the foundations of physical geography.

Mr. H. J. Mackinder: I came here, like Dr. Woodward, entirely as a listener to what I knew would be an interesting paper from Mr. Marr. There is one point

which struck me in what Dr. Mill said just now by way of commendation of Mr Marr, that he had avoided the use of the terms with which Professor Davis had equipped this branch of the subject. I agree with him, that this evening it was probably right to avoid the use of these terms, but I trust that no one will carry away the idea that they are therefore without use. Mr. Davis has done a very valuable thing indeed in giving us terms which, with all due deference to Dr. Mill, I cannot regard by any means as so uncouth as those with which most sciences are equipped. "Subsequent," "consequent," and so forth, enable us at once to compare the rivers or parts of rivers we have studied in any particular district with other rivers. During the whole evening, I could not help feeling how admirably the intellectual analysis implied in Mr. Davis's terminology fitted with every sentence by Mr. Marr. One other suggestion I would venture with great diffidence to put forth. Might there not have been, between the rising of the dome and the origin of the drainage, a period which the Americans would describe as of a "peneplain?" That, I think, would be in harmony with the view expressed by a speaker just now, and would explain why the centre of drainage does not coincide with the centre of structure.

Mr. MARR: Most of the words I have listened to have given me very great pleasure, and I thank you for the reception accorded to my paper. I am glad to hear Mr. Mackinder take up the cudgels in favour of Professor Davis's terminology, though it is somewhat technical, but had I used it, instead of hurrying over sentences which my hearers found it difficult to follow, I should have been able to replace sentences with words pregnant with meaning. I have already considered the possibility of the existence of a peneplain, but I am bound to say that I cannot explain the drainage by the existence of such a peneplain. That and what Mr. Strahan has said about the rocks which once extended over the district, are matters which are largely geological.

The PRESIDENT: I think I may congratulate Mr. Marr, and I am sure I may congratulate the meeting on his having been able to give us a most interesting address as an eminent geologist, which has been entirely geographical; for he has avoided strictly geological subjects, and has explained to us the actual changes which have taken place in a region well known to most of us, and the causes of these changes, which is physical geography; and in the discussion, what he has said has been illustrated by some of the speakers with reference to other parts not only of this country, but even of such distant countries as the basins of the Indus and the Brahmaputra. I am sure the meeting will desire me in their name to return very warm thanks to Mr. Marr for his most valuable communication this evening.

CRUISE OF THE "BALÆNA" AND THE "ACTIVE" IN THE ANTARCTIC SEAS, 1892-93.*

II. THE "ACTIVE."

By CHARLES W. DONALD, M.B.

LEAVING Dundee on September 8, 1892, we touched Madeira and the Falkland islands on our passage south.

We passed the first iceberg on December 18, at 4 a.m. It lay about 4 miles to the eastward, our position at the time being about lat. 61° 8′ S., long. 52° 7′ W. Clarence island, South Shetlands, was

* Continued from the May number. Map. p. 509.

sighted at the same time, bearing about W.S.W., and distant some 40 miles. It seemed to be almost wholly snow-covered. Soon after 9 a.m. we were steaming through water dotted here and there with large and small pieces of floating ice. These gradually increased in number as we advanced to the south. About 10 a.m. seven or eight bergs were in sight to the eastward; these were mostly flat-topped, in shape roughly rectangular. Their perpendicular walls rose 100 to 150 feet above the sea-level. Several measured over a mile in length. In some cases the cliffs showed little or no traces of water-wearing; others, again, had their whole faces scooped out to a height of 10 to 15 feet, with here and there low deep caverns showing. The colouring in these caverns was wonderful, every shade from a light green to a dark blue being seen as one looked deeper and deeper into them. During the afternoon we saw several penguins of the black-throated variety—*Dasyrhamphus adeliæ* (H. & T.)—either standing or lying on pieces of floating ice. Several whales of the finner tribe were seen, and one chionis. Light pack or stream ice was met with in lat. 62° 4′ S., long. 52° 13′ W. Shortly before 7 p.m. we were steaming along the east side of this. Several white petrel, seals, and penguins were seen about the stream. The day was somewhat foggy, though clear at intervals; occasionally rain fell. The wind during the morning and forenoon was N.E. and light, changing in the afternoon and evening to a moderate or fresh westerly breeze. Position at noon, 61° 38′ S., 52° 10′ W.

The morning of December 19 was foggy up to 11 a.m. Between 10 a.m. and 9 p.m. we were under steam, making a southerly and somewhat westerly course, the direction of the ship's head being frequently altered to avoid ice-streams or in order to cross them at their narrowest part. The ship was occasionally stopped to pick up a seal. The total distance run was about 36 miles. During the afternoon we passed numerous bergs, the large ones being for the most part to the eastward. Several finners, a bottlenose whale, several seals, and penguins were seen. The varied shades of blue colouring the snow on the floating ice were very striking. I remarked that by direct light the snow appeared white, while by transmitted light it was of a blue colour, varying in depth with the thickness of the stratum. At 9 p.m. we got beset in attempting to cross an ice-stream. The stream was composed of heavy pieces of cake or broken floe ice, with here and there small bergs. After four hours' work we got clear on the north side, the side on which we had entered. Snow fell from 10 p.m. up to 4 a.m. on the 20th. The barometer at 1 a.m. read 28·952 inches, being our first reading below 29 inches. Position at noon, 62° 10′ S., 52° 21′ W.

Thick fog forced us to lie to during the morning and afternoon of the 20th; the fog continuing, though not so dense, during the afternoon and evening. At 6.30 p.m. steam was started, and we navigated across the pack in which we had been beset on the previous evening. It was

from 1 to 1½ mile in breadth. Several large bergs were in sight during the evening; one in particular lying to the southward, and of which we only saw the western end, is, I believe, the same along which the s.s. *Diana* reports having steamed 20 miles. She gives the height as varying from 160 to 220 feet, the cliffs being perpendicular, and cut into at the base by numerous caves. Position at noon, 62° 45′ S., 52° 55′ W.

December 21 was marked by fog throughout. In consequence we made but little progress to the south. When the fog was not too thick, one or two boats were lowered to pick up seals near the ship. Prior to this date we had seen only the yellow seal, which corresponds to that mentioned by Ross as the crab-eater (*Lobodon carcinophaga*). The first of the sea-leopards (*Stenorhynchus leptonyx*) was got during the forenoon. Position at noon, 62° 54′ S., 53° 41′ W.

The wind during the 19th, 20th, and 21st, was northerly, with more or less of fog. During the 22nd the wind was more easterly, but the fog still continued. Sealing was carried out as on the previous days. Many of the skins got were very much scarred, one in particular having recent gashes extending through the skin and blubber into the muscle beneath. This was said to be the work of grampuses, or more probably the result of fighting amongst the seals themselves. Position at noon, 63° 9′ S., 53° 20′ W.

December 23 was gloomy, but the fog had cleared away before a light southerly wind. Soon after daylight the Danger islands were sighted. At 9 a.m. the largest bore W. by S., and was distant about 10 miles. Seven were counted in all, two of them being mere rocks, with little or no snow on them. The others were barren and partially snow-covered, black cliffs and solitary rocks standing out against the snow here and there. Steam was started at 7 a.m., and, with the exception of a few stoppages, kept up till 9 p.m., about 56 miles being made to the S.W. by S. The sea-water during this and the following day was of a dark brown colour. As seen against the tongues of ice, it was olive green. Tow-nets came up covered all over by small particles of brown vegetable matter having a fusty odour. Numerous bergs were seen in the neighbourhood of the Danger islands, all the larger ones being aground. These latter showed a distinct high-water line along the bases of their cliffs. At noon we passed within one-third of a mile of two large bergs, each grounded at one end only. The high-water line in these sloped down to meet the water at the end afloat. The upper part of both showed distinct horizontal striation. One had usual perpendicular fissures showing in its face, these, with one exception, opening at the top of the cliff. The latter was evidently of earlier formation. It did not reach within 30 feet of the top. I judged the height of these bergs to be about 150 feet. About 2 p.m. a small patch of land was seen looming out of the mist surrounding it. This bore about true west, and was, I imagine, part of Paulet island.

At 9 p.m. we steamed up to a small floe in lat. 63° 57′ S., long. 55° 20′ W., and then waited for the other ships to come up. On their arrival, the three ships steamed slowly along the floe in a south-westerly direction. Position at noon, 63° 32′ S., 54° 34′ W.

During the morning and forenoon of December 24 slight drizzling snow fell, with light southerly winds. The afternoon and evening were, with the exception of one snow-shower, marked by a very clear atmosphere and sunshine, the wind being not more than a light air from the south. During the forenoon, as the snow cleared away, the mountains of Palmer's Land were sighted to the west. The summit of Mount Haddington, rising to a height of 7050 feet, was distant about 50 or 60 miles. The somewhat flat land of Seymour island was visible some 15 to 20 miles to the west. Throughout the forenoon and afternoon the *Active*, *Balæna*, and *Diana* sealed in company, making at the same time fair progress to the south-west. At noon our position was 64° 14′ S., 55° 51′ W. At 6 p.m. we steamed up to an ice-floe which extended, as far as I could see from the deck, to the south. To this the three ships anchored. The position ascertained by observation on the following day at noon (supplied by Mr. Bruce) was lat. 64° 23′ S., long. 56° 14′ W.

The surface of the floe was very uneven, little hillocks and peaks of ice sticking up every now and then. The snow was loose and soft, allowing one to sink above the thighs at every few steps. Several fresh-water pools were seen in the hollows. Lying lazily behind the hummocks a few seals were seen. These did not appear to be frightened by our approach, and, when disturbed, made no attempt to reach the sea. A few large emperor penguins were seen on this and on the smaller floe passed on the previous evening. The view from the ship's deck was very impressive. To the west the dark mountains of Palmer's Land were thrown into various shades of light and dark by the now low sun. To the south the floe reached as far as the eye could see, with here and there large hummocks or small bergules thrown into deep shadow against the dazzling whiteness of the general surface. Out to the eastward was a chain of bergs, their perpendicular faces tinged a bright red from reflection of the sun's rays; between these bergs and the floe was an open expanse of dark water. To the north lay the loose scattered ice, small bergs, and dark water-channels through which we had steamed. The absolute stillness and quiet, broken only occasionally by splash or harsh "quaugk" of a penguin or the soft "tweet" of the white petrel, made this a magnificent and imposing spectacle. Shortly before midnight I rowed past a berg on which was a quantity of land-earth.

Christmas Day was one of the finest we spent among the ice. It was nearly calm, with bright sunshine for the greater part of the day. The temperature of the air during the early part of the afternoon rose to 37° Fahr. The atmosphere was very clear. By daylight the spectacle

of last night seemed somewhat harsher in outline, but in the twilight, with the sea like a mirror, and slight ice forming on the surface, the effect was, if possible, enhanced, and acted on one like a spell. During the whole day large pieces of ice and small bergs were moving at a considerable rate along the floe edge, forcing the ships to change their position frequently. I also noticed, from hanging a line over the stern, that there was a current running from beneath the floe at a depth of about 10 feet. It ran with a speed of from 1 to 1½ knot in a direction slightly to the east of north. A sounding taken by the *Balæna* in this position gave a depth of 200 fathoms.

Early on the morning of December 26 we cast loose from the floe. Soon after 8 a.m. we got under sail. During this and the following three days we cruised to the N.N.E. under sail, in search of whales. A few seals were picked up each day. The wind during these four days was easterly or north-easterly. From light to moderate or fresh breezes. The temperature of the air was for the most part slightly below the freezing-point. The weather was clear, though overcast and somewhat gloomy.

At noon on December 29 we were in lat. 63° 48′ S., long. 55° 46′ W. On the 30th, at 9.30 a.m., our position was about 63° 44′ S., 55° 34′ W.; Paulet island bearing N.N.W. (true), distant about 8 miles. Light easterly and north-easterly winds prevailed. During the day we sealed among scattered ice, working in company with the *Diana* towards the north of Paulet island. During the evening we passed several grounded bergs, which had on their tops and sides stones and earth. A northerly current was flowing past them at a rate of 1 to 2 knots. At 11 p.m. Paulet island bore S.W. by S., distant about 4 miles. Its shores, as seen through the glass, seemed dotted with penguins and loose stones. A valley running down the northern side was strewn with boulders, and had a rich brown colour, which I supposed at the time to be due to some form of lichen or moss. A similar colour was, however, observed on a beach where I effected a landing, no vegetation being found that could have been seen from the ship. We sailed for 1 or 2 miles along the land to the westward of Paulet island, there being still open water as far as we could see to the W.N.W. After this we turned, and, in company with the *Diana*, steamed out to the eastward again. The weather was fine and clear.

December 31 was marked by light south-easterly winds and bright sunshine. One large berg was seen with a quantity of earth upon it. At times during the day we had as many as a hundred bergs in sight at one time. The *Diana* kept us company all day. Our position at noon was 63° 33′ S., 55° 10′ W.

On New Year's day, 1893, the wind was still light, but more northerly; the day clear, though with but little sunshine. At noon the other three ships were all in sight, our position being 63° 41′ S., 55° 12′ W.

At 5 p.m. a whale was seen close to the ship, lying on the surface of the water, in a manner said to be very similar to that of the Greenland whale. It had a short dorsal fin.

During January 2 light northerly and westerly winds or calms prevailed, with bright sunshine all day. Our position at 11 a.m. was about 63° 47′ S., 55° 37′ W.; Paulet island bearing N. by W., and distant about 10 miles. In the forenoon a small avalanche was seen on the land to the north of Paulet island. The sound caused by the breaking off and falling down of these or smaller masses of ice can, on a calm day, be heard for miles around. Mountain peaks were seen to the N. and to the S.W. During the day we worked southwards and westwards into Erebus and Terror gulf. In the evening we passed a small piece of ice with a quantity of land-earth on it. At midnight several small finners were playing about the ship.

During January 3 a cold north-easterly wind blew, and some snow fell. During the afternoon a rocky island was sighted. It does not seem to be named on the chart. At 4 p.m. this island bore some 3 to 4 miles to the S.W. It stands from 200 to 300 feet in height, and is probably about 1½ mile in circumference. There was but little snow on it. Upon the top a greenish-brown colour was observed, similar to that previously seen on Paulet island. One or two photographs of this island have turned out pretty well. During the evening two boats were lowered after a whale, which in its movements was said to resemble the Greenland whale. Several bergs and pieces of ice were observed with quantities of earth and stones on them.

On January 4 we cruised about the same ground. An easterly wind blew strongly during the morning, dying away during the afternoon and evening. The weather was somewhat misty; light snow fell occasionally. In the afternoon several large schools of penguins were seen, each school being controlled by a single individual of a larger species, which swam in the rear. Several bottlenose and finner whales were seen. During the evening there was a strong current or rather tide running west. The lead was thrown twice in about lat. 63° 28′ S., long. 56° 8′ W., and gave no bottom at 80 and 90 fathoms.

January 5 was the only day for which an absolute calm was reported for the whole twenty-four hours. During the forenoon we were sealing about the same ground as on the two previous days. At noon one of the boats fastened a whale. For the next thirteen hours the utmost endeavour was made to land him, but the task proved too much for us. The chase finished at 1 a.m. with the escape of the whale. It carried away with it half a dozen rockets, two harpoons, and some line. From a description of this whale which I showed to Prof. Thompson, of University College, Dundee, he recognizes it as a hunchback (*Megaptera longimana Antarctica*). We now (1 a.m.) lay 3 or 4 miles south of the western entrance of what Captain Robertson

afterwards named "Active Sound." This would make our position about 63° 21′ S. and 56° 39′ W. Another unnamed islet bore S. by W. about 6 or 7 miles.

On January 6 we pushed into the mouth of Active sound, our position at noon being lat. 63° 17′ S., long. 56° 35′ W., which would correspond with the western entrance of the sound. The wind was squally, and blowing strongly at times from the E. to N.E. To the east of us, as we lay almost land-locked, was a low flat beach about 1½ mile in length, and lying nearly north and south. There was but little snow on it, the surface appearing of a greenish-brown colour. To the north-east (by compass) the land was low, the ice-foot lining it being not more than 30 or 40 feet in height. The snow sloped upwards from this to a height of 150 feet or more, being intersected here and there by cracks and crevasses running parallel to the ice-foot. This ice-foot is broken, about a mile to the north and east of the beach, by a spur, which runs out towards the north-west, forming another similar but smaller beach. Over the innermost part of the spur, a small peak or corner shows black against the surrounding snow. To the north-west (by compass) the ice-foot was more irregular, reaching at its highest 60 feet or more. From this the snow sloped upwards much more rapidly than on the opposite side of the sound, the crevasses being wider and more numerous. At some distance inland a black peak showed through the snow, rising to a height of 300 feet or more. Nearly west (by compass) of us lay an irregular sloping face, dark brown in colour, and rising somewhat steeply to a height of about 100 feet. A spur of snow running down the centre divides it into two horns. This, seen through the glass, proved to be a large penguin rookery, the birds being seen in almost countless numbers. To the south (by compass), and some 10 miles distant, lay the unnamed rocky islet seen on the previous evening.

In the evening I landed on the beach which lay to the east of us in about lat. 63° 18′ S., long. 56° 35′ W. There was evidently a considerable rise and fall of the tide, which was about half flood, with still some 5 to 7 feet to rise. Along the tidal margin were quantities of dark grey or black sand, various seaweeds, a few shells, small blocks of red and grey granite, bits of sandstone, conglomerate, and black igneous blocks. Several vertebræ and other bones of a whale, all much decomposed, were found opposite our landing-place. Further inshore I picked up a piece of whalebone, said to be "finner bone."

Advancing inshore, I found the surface composed of small flattened angular stones. There was, for the most part, not a trace of lichen or moss about them. Here and there large black igneous blocks rose above the general surface. In the hollows were a few pools containing snow-water; near these I found a few small patches or rather tufts of moss. Near the centre of the beach, which was about a mile broad at

this point, I found the bleached skeletons of two young seals, with some of the long white fur still attached. Near the ice-foot, in the north-west corner of the beach, I came across a small penguin rookery, composed solely of the white-headed species (*Pygoscelis papua*). There were about forty nests in all, and most of the eggs were hatched. Several terns, saddle-back gulls, and a species of skua were seen near the rookery, but no penguins of a different species were seen within a mile of it.

From this beach I took as many specimens as possible. Numerous seals were got on the shore, almost all of them being of the small black-backed spotted variety, the *Omatophoca Rossii*, a species somewhat resembling the *Stenorhynchus leptonyx*. They were in very good condition. Large flocks of the great petrel were seen. During the evening a large finner whale was seen to jump like a salmon quite clear of the water. This occurred several times within 500 yards of the ship. A sounding was got within half a mile of the shore, which gave bottom at 40 fathoms. Soundings further out gave no bottom at 50 fathoms.

During the morning of January 7 slight snow fell. Shortly after noon the sun shone out brilliantly. At 1 p.m. it was quite calm, the sea like a mirror. To the south numerous finners were seen lying on the surface of the water, and sending their slender blasts high into the air. Lying in this position, I took from the west a series of photographs of the surrounding land, completing, as nearly as possible, the circle of the horizon. Shortly after 2 p.m. steam was started, and we proceeded in an easterly direction up Active sound. In breadth it averaged about 2 miles. The two shores were nearly parallel, running E. ½ N. and W. ½ S. (true). About 3 to 4 miles up the sound we passed, in the western shore, a conspicuous hill rising abruptly to a height of 500 to 600 feet. This, so far as I know, has not been named. I took a photograph of it bearing W., and also a sketch bearing S.S.W. Soundings taken as we came along gave no bottom at 40, 60, and 80 fathoms. The shores of the sound are lined by an ice-foot, averaging on the northern side about 60 feet in height, and somewhat lower on the southern side, with only here and there a rock or small beach showing beneath the ice-foot. On the southern side the snow sloped gently up from the top of the cliff, reaching not more than 100 to 150 feet. On the northern side the slope was much steeper, the land rising higher, with here and there corners of rock standing out black against the snow. Several small bergs, some of peculiar shape, were seen in the sound. At 10 p.m. fog came on, and the ship was made fast to a piece of ice close to the ship.

Early in the forenoon of January 8 we entered a bay opening off the north shore of the sound. To this the name of "Gibson Bay" has been given by Captain Robertson. The distance between the two points bounding the bay is about 2 miles, the greatest diameter of the bay about 3 miles. The shore is almost wholly bounded by an ice-foot from

60 to 70 feet high. There is little or no beach to be seen. At the head of the bay, to the N.W., lies a skerry 100 to 150 yards distant from the ice-foot. The eastern point—which has received from Captain Robertson the name of "Cape Alexander"—is formed by a steep hill or cliff, rising to a height of about 200 feet, with an inclination of 65° or 70°. The exposed rock is black, and seemed hard and crystalline. At the extreme point is a talus. The cliff facing the bay is crossed by two distinct narrow beds of a softer shale-like stone of a light brown colour, dipping towards the south at an angle of about 45°. Immediately underneath these interstratified beds were seen (with the glass) numerous flat angular stones of the same colour, seemingly indicating material of a softer nature and stratified arrangement. These I supposed might be beds of shale deposited on the top of volcanic matter. The general dark colour of the rock was relieved here and there by shades of orange, probably due to some oxide of iron. The opposite point of the bay is low and snow-covered. The bay itself was for the most part filled with loose pack-ice, on which numerous seals were lying.

On moving eastwards out of the bay at 5 p.m., it became evident that we had open water out towards the S.E. The north shore runs in a direction about S.E. $\frac{1}{2}$ E., while the southern shore runs about S.E. by E. The land lying to the south of us was therefore a separate island, completely severed from Joinville island by the channel in which we were then lying. The island was named by Captain Robertson "Dundee Island." Active sound extends, I believe, as far east as Gibson bay, while that portion of the channel to the east and south of Gibson bay has received the name of "Tay Firth." In summarizing these points, I must state that I think them far from accurate. I felt greatly the want of a chart on the spot, and many of the bearings I took are untrustworthy—whether through fault of mine or from the compasses being affected by the land, I am not sure. I feel very uncertain of the geography around the western entrance of the channel. The various names given by Captain Robertson I got from the *Scotsman* of June 10, 1893.

To the best of my knowledge, the channel which separates Dundee island from Joinville island is about 26 miles in length. In breadth it varies from 2 miles in its western portion to 5 miles in the eastern portion. The western portion, Active sound, runs E. $\frac{1}{2}$ N. and W. $\frac{1}{2}$ S. It is about 14 miles long. At its western entrance are two penguin rookeries; that on the north shore, a very large one—probably occupied by the common black-throated variety, the *Dasyrhamphus adeliæ;* that on the south shore—a small one of some forty or fifty nests—occupied by the white-headed variety, *Pygoscelis papua.* The positions of these two rookeries may be taken as: the former, 63° 15′ S., 56° 36′ W.; the latter, 63° 18′ S., 56° 35′ W. Some 7 or 8 miles up the sound, on the north shore, is the conspicuous hill already referred to. Its position is

about 63° 14′ S., 56° 20′ W. Both shores are lined by an ice-foot, that on the southern side being more regular and lower. In mid-channel casts of the lead gave no bottom at 40, 60, and 80 fathoms. The sound is terminated on the east by the western point of Gibson bay, opening off the north shore, and described above. This bay forms the head of the Tay firth. The position of its eastern point, Cape Alexander, may be taken as lat. 63° 15′ S., long. 56° 3′ W.

The general direction of "Tay firth" is S.E. ½ E. and N.W. ½ W. Its length, taking Cape Alexander as the western limit, is about 16 miles. In its western portion it measures about 5 miles across, narrowing down to about 4 miles as it advances east. The southern shore resembles that of Active sound. The northern shore presents at least one marked feature. This is a narrow bight, or geo, opening immediately to the east of Cape Alexander. It runs inland northwards for about a mile, curving to the west at its extremity, thus making a peninsula of Cape Alexander. It narrows rapidly from 600 to 800 yards across at its mouth, to 200 or 100 yards some distance inland. Its sides are lined by ice-cliffs some 200 feet or more in height. We penetrated a short distance into it a day or two later. On the eastern side of the entrance is a small penguin rookery. About 3 miles east of this, on the north shore, is a large penguin rookery, occupied by the common black-throated variety, the *Dasyrhamphus adeliæ*. A boat's crew effected a landing here on January 11, and obtained specimens of the eggs. The nests they describe as innumerable, and divided into blocks by paths placed at regular intervals, and intersecting each other nearly at right angles. On this north side the land slopes rapidly up from the ice-foot, leaving only the double peak of Mount Percy visible to us over the high ground in front. Our position at noon in Gibson bay was lat. 63° 14·5′ S., 56° 4′ W.

During the afternoon of January 9 we were sealing some 3 to 4 miles south-east of Gibson bay. Slight fog came down about 4 p.m., the wind having fallen from a moderate breeze to calm. Soon after 6 p.m. we lay to for the night.

On the 10th we had a short though somewhat sharp gale. The barometer had been slowly falling during the last two days, and reached 29·020 inches at 12.30 p.m. During the morning the wind rose from the south, and during the forenoon blew a gale. About 2 p.m. the wind was squally, blowing at times with a force of 9. Full steam was necessary to prevent the ship being driven to leeward.

At 2.30 p.m. we ran aground on a reef rising to within 1½ fathom of the surface at low tide. The reef is situated within a mile of the southern shore, and from our position on it Cape Alexander bore N. by E. ½ E. (true), distant 3½ to 4 miles. About half a mile inshore of us, and bearing S. by W. ½ W., was a skerry, rising some feet above the surface. The shore itself was lined by a low ice-foot. The position of this reef

—which may be called the Active reef—may be taken as lat. 63° 19′ S., long. 56° 7′ W. As the afternoon and evening drew on, the wind gradually died away. Vigorous attempts were made to get the ship off, but the falling tide at first rendered all our endeavours futile. The tide seemed at its lowest about 5 p.m., there being at that time 1½ fathom of water on the reef. The reef itself was composed of rough angular rocks, the surface being covered by seaweed and small stones. As the tide rose attempts were renewed. A line was run over the stern to a grounded berg some 80 to 100 yards off. A considerable strain on this, aided by the engines reversing at full speed, was at length successful, the ship gliding off at 9.15 p.m., to all appearance little the worse of the accident. We steamed out south-eastwards into open water, thus completing a circuit round Dundee island.

January 11 was warm and sunny. During the forenoon we were sealing to the south and east of the entrance to the Tay firth at about 10 hours. Paulet island bore W.N.W. and distant about 4 miles. About 1½ hour's steaming from 12·30 p.m. brought us to the ice on north shore of the Tay firth. The ice had collected here in considerable quantity as the result of the southerly wind yesterday, and a number of seals were found basking on it. Photographs were taken to illustrate the mountainous scenery to the west and north.

From our position in Tay firth at 7 p.m., Paulet island bore S. (true), distant about 12 miles. Lying just open of Paulet island to the eastward, and somewhat nearer us, was the rock or islet which I believe Sir James Ross calls Eden islet. Cape Alexander bore N.W. by N., distant about 8 miles, while the conspicuous hill on the north shore of Native sound lay to the westward just open of the north shore of Dundee island. Soon after 7 p.m. steam was started to the south. A northerly breeze springing up at 9 p.m., steam was stopped and the ship put under sail. Paulet island at this time bore west.

The position assigned by Sir James Ross to D'Urville's monument would place it on the western part of Dundee island. It is quite possible that it may be there, but I do not remember seeing it. It has occurred to me that Sir James Ross and D'Urville may both have seen the conspicuous hill referred to as situated on the north shore of Tay firth, and that Ross may have applied the name to this. I cannot say that I agree with Captain Robertson in thinking that the channel is capable of division into an eastern and western portion. I consider that it is one channel, and that no sufficient line of demarcation can be drawn between what he calls "Active sound" and "Tay firth."

The position of Dundee island is clearly defined as the southern portion of Joinville island. In shape it is long and narrow, its extreme length being 29 miles, and its average breadth about 4 miles. Its surface is flat and snow-covered, nowhere rising above 150 feet.

We continued under sail during the night of the 11th, and by 9 a.m. on January 12 had made about 40 miles to the south of Paulet island. Out to the westward of our position, and some 8 to 10 miles distant, lay Seymore island. It is somewhat flat and streaked with snow. Over the northern extremity of this we could make out from the deck what I believe to have been Cockburn island.

During the forenoon the other ships were sighted to the south and eastward. Steam was started about 1 p.m., and we ran down to the *Diana*, heading to the south of east. About 3 p.m. we passed an ice-floe, which I feel convinced was the same to which we were anchored on Christmas Day. This being so, the floe had drifted about 12 miles to the N.N.E. between December 25 and January 12. During the afternoon several finners, grampuses, and bottlenoses were seen. The day, though overcast throughout, was fine, light northerly and south-easterly winds prevailing. Our position at noon was lat. 64° 13′ S., long. 56° 10′ W. During the night we remained hove to.

January 13 was spent sealing among loose pack ice. The weather was fine and calm. There was no land to be seen from the deck. The seals got were for the most part of the yellow variety (*Lobodon carcinophaga*), these being found in small "patches," six to eighteen seals on a piece. The spotted varieties, sea-leopards, are found singly, or at most in twos or rarely threes, on a piece. Numerous finners, grampuses, and bottlenoses were seen. During the afternoon we got a penguin with a black ring encircling the throat (*Pygoscelis Antarctica*), this being the first of that species seen by us. Soon after 8 p.m. we lay to for the night, with the *Polar Star* in company. Between 9 and 10 p.m. we witnessed a very fine sunset. While sealing we made some 10 to 15 miles to the eastward. Our position at noon was lat. 64° 13′, long. 55° 46′ W.

The 14th was spent as the previous day. Light north-easterly winds with sunshine prevailed. During the forenoon we had some ten to twelve large bergs in sight. During the afternoon another variety of penguin was seen by the crew, and described as having a white spot on the crown of the head, orange bill and feet, and a black ring encircling the throat—that is to say, combining the characteristics of the *Pygoscelis papua* with those of the *P. Antarctica*. This would go far to prove that the ring is not the distinctive mark of separate species, but merely indicates varieties of more common species. During the day we made about 12 to 14 miles to the E.N.E. Our position at noon was lat. 64° 11′ S., long. 55° 30′ W.

Throughout the night we remained hove to. At 9 a.m. on the 15th I shot a chionis, sitting on a piece of ice near the ship. Soon after 9 steam was started. We progressed slowly to N.E. by E., stopping here and there to pick up seals, probably making about 22 miles up to 4 p.m., when we were forced to lay to in fairly open water on account

of dense fog, which lasted all the evening. The forenoon had been bright and sunny. Our position at noon was lat. 64° 4′ S., long. 55° W. The fog continued during the following day, with light N. to N.N.E. winds. We did not shift ground to any extent.

January 17 was still somewhat misty, with moderate breezes from N. to N.N.W. Steam was started at 5.30 a.m., making about 40 miles to N.E. by N. At 8 p.m. sail was set, the course being altered to N.E. by E. for about 12 miles. We then wore ship to clear some pack-ice, and again stood to the north and east. Position at noon, lat. 63° 51′ S., long. 54° 16′ W. We continued under easy sail during the night, making a N.E. by E. course.

During the 18th we steamed at intervals in the same direction, stopping to pick up seals here and there. Our distance for the day was about 50 miles. During this and the previous two days, as we were making to the north and away from the land, the penguins gradually decreased in numbers. This was not to be accounted for by any change in the character of the ice. On our return south and westwards they gradually increased again. Our position at noon was lat. 63° 18′ S., long. 52° 45′ W. During this and the following day several blue petrel were seen. They seem to go further south into the ice on the approach of boisterous weather.

The ship was put under sail for the night, making some 5 to 6 miles to the north by the morning of the 19th. The day turned out snowy and misty, the wind blowing up to a moderate gale from the south-west during the afternoon. Our position at noon was 63° 0′ S., 52° 5′ W. At midnight the clouds over the whole sky were tinged of a deep red. We lay still all night.

The morning of January 20 broke with dense fog, and light W. to W.S.W. breezes. The fog gradually thinned away, until at last we could see blue sky through it. At this time we were lying in fairly open water—no ice to be seen from the deck. There was a considerable northerly swell running. Soon after 11 a.m. the day cleared up, with blue sky and bright sunshine. Steam was started to S.S.W. Observations were got at noon. The captain reported that we were "90 miles off the land," and that the magnetic variation was "15° E." Our position at this time was lat. 62° 58′ S., long. 52° 44′ W. Soon after noon, a large berg, about 10 miles long, was seen 5 or 6 miles to the westward. The afternoon was spent in sealing. The seals were scattered, and mostly of the large spotted variety. We lay to for the night at 8 p.m., having made in all about 20 miles on a S.W. by W.$\frac{1}{4}$ W. course (true).

January 21 turned out very much the same—foggy in the morning, and clearing up splendidly soon after 9.30 a.m. At 2 p.m. the temperature in the shade stood at 40·7° Fahr. During the day a very gentle westerly wind blew, bright sunshine continuing until after

7 p.m., when the wind changed to south, and fog came down. Steam was started at 8 a.m., and kept up more or less steadily until 10 p.m. We had made 45 to 50 miles on a S.W. ½ W. (true) course. But little sealing was done during the day; the ice was mostly in loose streams. At midnight several grampuses were seen playing about the ship's quarter. Our position at noon was 63° 15′ S., 53° 13′ W.

Steam was started again at 5.15 a.m. on the 22nd, and kept up till 11 hours, about 20 miles being made to the S.S.W. The day was bright and sunny, with light westerly winds or calm. At 11 hours sealing was commenced, the other four ships being in sight to the S.W. and S. The yellow seals were numerous, in "patches" of from ten to sixteen, with occasionally a single spotted seal on the same piece of ice. During the evening numerous cetaceans, somewhat resembling the grampus, were seen, of the exact species of which I am still doubtful. At 10 p.m. we made fast to a piece of ice, and spent a couple of hours in filling our water-tanks. Position at noon, lat. 63° 48′ S., long. 54° 16′ W.

January 23 was spent in sealing, within a few miles of our position in the evening. All the five ships were within 5 miles. During the forenoon the atmosphere was calm and remarkably clear. Some snow fell during the afternoon and evening. The seals were mostly of the large black variety, some of them measuring 12 and 13 feet in length. The ice was in loose detached streams. Our position at noon was lat. 63° 52′ S., long. 54° 33′ W. The barometer fell 0·2 inch during the day, from 29·203 inches, and continued falling until noon on the 24th, when it stood at 28·834 inches.

During the 24th the wind blew freshly or strongly from the E. to S.E., with some snow and mist. We spent the day in company with the *Jason*, slowly steaming head to wind. In the evening I went on board of her, and met Captain Larsen. He is a frank and very pleasant man, and one who seemed to take an enthusiastic interest in everything connected with the expedition. He had made the ice much further east than the Scotch ships, and had landed on the South Orkneys. He describes a variety of crested penguin as seen there, which is in all probability a new species. He states that in lat. 64°, long. 45° to 46°, he saw large flocks of the great penguin—in all probability the emperor. None of the smaller sizes were seen in the vicinity of these flocks or schools. He also landed on Seymore island. There he got a number of fossil shells and pieces of fossil wood, and a few round stone balls with a concentric arrangement of layers—to all appearance an old lava bomb.

Though we saw any quantity of these fossils and balls, we saw no signs of vegetation. Some of the fossils are at present in the hands of Prof. James Geikie, who has kindly promised to examine them along with some other geological specimens.

At 9 p.m. all the five ships were within a mile. A slight easterly

swell made itself felt during the day. We made not more than 10 to 15 miles to the south. Our position at noon was 63° 57′ S., 54° 36′ W.

The following three days were spent sealing to the south and west of this position. The weather was fine, with some amount of sunshine, and light southerly and easterly breezes. The ice was in the form of loose packs and streams. Several bergs were in sight, mostly out to the eastward. The penguins were very numerous on the 27th, being seen in flocks of fifty to a hundred on one piece of ice. During the calm evenings of the 26th and 27th I stood for several hours on the bridge, watching the finners playing and jumping about the ship. Our position at noon on the 27th was lat. 64° 16′ S., long. 55° 18′ W.

January 28 was spent in a similar manner. Shortly before 8 p.m. the wind began to rise from the south, and blew freshly for the rest of the night. At midnight we were lying on the weather side of a chain of bergs, towards which wind and tide were both sweeping, forcing us to steam out into more open water, where we hove to for the night. Our position at noon was lat. 64° 18′ S., long. 55° 26′ W.

During the night and morning of the 29th the wind steadily rose, and by noon had reached a moderate gale. During this and the following three days the gale continued, at times blowing a strong gale (force 9). The same tactics were observed during the four days. We lay in an open pool of water in the lee of a heavy ice-stream, which completely broke the force of any sea or swell occasioned by the gale. Fast though this stream drifted, we drifted somewhat faster, and were thus forced to steam head to wind at intervals of about two hours to regain the shelter. We drifted on the average about 30 miles a day, there being a current in addition to the wind, setting to the north and east. During most of the four days there was a crossed southerly and north-easterly swell.

The barometer, which on the 27th had been up to 29·582 inches, gradually fell during the four days, reaching 29·900 inches at 4 a.m. of the 31st; then, after rising to 28·952 inches, made another drop to 28·880 inches at 4 a.m. on February 1, after which it steadily rose. A considerable quantity of light drizzling snow fell during the continuance of the gale. The general direction of our drift was N.N.E., and we must have passed within 14 miles of the Danger islands—without seeing them, however, as we passed them during the night of the 30th and morning of the 31st. A few birds kept company with us, chief among them, both in size and number, being the great dusky petrel. The others were the stormy petrel, the cape pigeon, the beautiful snowy or white petrel, and a variety of tern. Very few penguins were seen. On the 31st a white-headed penguin, the *Pygoscelis papua*, was seen swimming about the ship and giving vent to its extremely harsh "Quaugk, quaugk."

On February 1 another school of those cetaceans mentioned on

January 22 was seen. The grampus and several finners were also seen. Numerous seals of the spotted variety were scattered over the stream to windward of us. While drifting in this way I kept a tow-net constantly dragging in our wake, though with occasionally but small result. All the best nettings were got during the night. During the afternoon the wind began to moderate, and between 7 and 8 p.m. was sufficiently down to allow of us making steam to the south. We made a southerly and westerly course for three hours, and then lay to for the night in shelter of a small ice-stream. Our position at noon on this day was lat. 62° 44′ S., long. 53° 56′ W. The total drift during the four days was roughly 110 miles.

On February 2 the wind still blew from the south and east, but was down to a light breeze. Steam was kept up in a more or less southerly direction from 4.30 a.m. to 7 p.m. At 2 p.m. part of Joinville island was sighted to the S.W., the course being then changed to about S.S.E. At 2 p.m. we came across a small ice-stream somewhat thickly covered with large spotted seals. Five boats were sent away, and about 2½ hours sufficed to clean the "patch." We then lay to for the night. Our position at noon was 63° 1′ S., 54° 32′ W.

February 3 broke clear, though overcast, with a gentle breeze from the south and east. We steamed from 7 to 11 a.m., doing about 10 miles to the south, after which the ship was put under sail in order that some necessary repairs might be executed on the engine. Land was in sight all day to the S.W. and S.W. by S. This, I have little doubt, belonged to the Danger islands. Our position at noon was lat. 63° 29′ S., long. 54° 17′ W.

The 4th brought us a return of bad weather. Strong winds from the S.E. to S.S.E., with heavy snow, fog, or mist, prevailed, throughout the day. The ship was kept manœuvring in shelter of various small ice-streams. We had the *Balæna* in sight to leeward during the afternoon; at 9 p.m. the captain and I went aboard of her and spent a pleasant evening. Very heavy snow was falling as we returned to the *Active* at midnight. Our position at noon was lat. 63° 22′ S., long. 54° 15′ W. The following day did not present any very marked improvement; we continued drifting about among loose ice-streams, and occasionally steaming to windward. Position at noon, 63° 17′ S., 54° 14′ W.

The morning of February 6 was overcast, but the sky was brightening all along the horizon. A gentle southerly breeze blew during the forenoon. Shortly after 9 a.m. the day cleared up, blue and bright sunshine continuing for the rest of the day. Steam was started about the same time to the S.E. by E. ½ E. From 4 p.m. up to about 9 the *Balæna* and we steamed in company making a course about S.E. ½ E.; and then we made fast to a piece of ice, and spent a few hours in watering the ship. During the forenoon we had the north-eastern part of

Joinvile island in sight, our position at noon being lat. 62° 24′ S., long. 54° 4′ W. During the afternoon it fell quite calm, after which a breeze sprang up from the W., changing to N.N.W. During the night it blew a strong breeze from the N.W., with four hours' snow. Shortly after 6 a.m., the wind having fallen, dense fog came down, and continued more or less till 11 hours. At 10 the fog had thinned considerably, and blue sky could be seen through it overhead. The positions of bergs could be made out by the brilliant whiteness of the fog immediately over them. To the westward we saw a beautiful fog-bow, called by the sailors a "fog shaffer;" as we stood on the bridge the two ends seemed to meet under our feet. This is a very common phenomenon in Greenland. It is believed by the sailors to eat up the fog. At 11 a.m. steam was started to S.E. by E., the *Balæna* being sighted on the port quarter. Bright sunshine continued throughout the day. At noon the dry-bulb stood at 40·4° Fahr.; on exposure to the sun, it rose to 51° Fahr. During the afternoon numerous finners and grampuses were seen. In the evening, about 6 p.m., the atmosphere was very clear; there was a great amount of refraction, the ice twenty miles off appearing thrown up into the sky to a height of 10° or 12°. I went on board the *Diana;* she and the *Jason* had just come north from about 65° S., and reported nothing but berg ice in large sheets, no very open water being seen, as one would have expected after the long continuance of southerly winds. They said they could have got further south, but saw no advantage to be gained from it, so returned. The seals prefer the rough, loose pack ice to those flat stretches of bay ice. Dense fog came on at 11 p.m., but thinned away very rapidly soon after. Light W.N.W. winds prevailed throughout the day. Our position at noon was lat. 63° 55′ S., long. 53° 10′ W. Our distance for the day was about 35 miles. Numerous bergs were seen, more especially out to the eastward.

During the morning and forenoon of the 8th the wind was northerly, with fog and rain. At noon a small fog-bow was seen, and soon afterwards the fog lifted. At 3 p.m. the wind suddenly veered to S.W., and rose rapidly. The dry-bulb fell quickly below the freezing-point, and snow took the place of the previous rain. It blew a fresh gale all night, taking off during the morning of the 9th. The general direction was about S.S.W. During the afternoon the wind fell to a light air, and shortly after 8 p.m. changed to N.N.W. During these two days we made about 44 miles, in a direction about N.E. by N. Our positions at noon on the two days were: on the 8th, 64° 15′ S., 52° 28′ W.; on the 9th, 63° 51′ S., 51° 54′ W.

Heavy fog came down at daylight on February 10, gradually dispersing during the morning before a light N.N.W. breeze. During this and the following days we saw numbers of white-throated penguins. These I believe to be the young of *Dasyrhamphus adeliæ* (H. & T.), and

not a separate species, as described by Dr. O. Finsch. Our position at noon was 63° 38′ S., 51° 45′ W. We made some 8 to 10 miles in a N. by W. direction during the day.

February 11 we spent sealing in a small field of pack ice. There were several bergs in the field or immediate neighbourhood, which seemed to move at a considerable speed in a northerly direction, cutting a path through the pack. The ice, especially during the afternoon, was reeling about a great deal without apparent cause, and threatening to enclose the boats, and even the ship itself. Our position at noon was 63° 33′ S., 51° 49′ W. At 9.30 p.m., dense fog came on, and lasted all night. The barometer was fairly steady, averaging for the day 29·254 inches.

The fog continued with little or no wind up to 9 a.m. of the 12th, when the wind began to rise rapidly from the S.S.E., light snow taking the place of the previous fog. By noon it was blowing a "moderate gale" from the S. by E., rapidly increasing to a "strong gale" at 4 p.m. The ship was simply allowed to drive before the gale, through loose ice-streams or pack, only steaming clear of the larger pieces or bergs. The barometer fell up to 8 p.m., when it read 29·030 inches, and after which it began to rise. The gale continued throughout the night.

At 2 a.m. on the 13th, we drifted in the darkness close to the weather side of a berg, getting at the same time entangled in some heavy pack ice. Happily, we got clear without accident. The gale continued, though somewhat abated in force, up to 4 p.m. The readings of the dry-bulb for this day averaged 26·2° Fahr., being the second lowest daily average recorded. Our midday positions for these two days were: the 12th, 63° 25′ S., 51° 51′ W.; the 13th, 62° 31′ S., 52° 2′ W. During the continuance of this gale we drifted nearly 80 miles to the north.

February 14 turned out bright and sunny, with light south-easterly and northerly winds. During the forenoon an island was sighted bearing N.W. This must have been Clarence island, though seen at a distance of nearly 60 miles. The clear atmosphere and great refraction made this quite possible. The day was spent in sealing amongst loose ice; our position at noon was 62° 1′ S., 52° 5′ W. We made a few miles to the south and west during the day, the same being true of the three following days. On the evening of the 15th we had a very marked and sudden change of weather. Within two or three minutes the wind went round from N.N.W. force 2 to S.S.E. force 7. Hard frozen snow immediately took the place of the previous drizzling rain. All the temperatures went down instantly, and the barometer began to rise within five minutes. Our position on the 17th was lat. 62° 21′ S., long. 52° 57′ W. On the evening of the 17th, while on board the *Jason*, Captain Larsen informed me that, when in lat. about 64° 40′ S., long. 56° 30′ W., he had seen land out to the west and south-west. This

statement is corroborated by Mr. Burn Murdoch, of the *Balæna*. In all probability this is the east coast of Graham's Land. Sir James Ross must have been within sight of this land, had the weather been clear, when lying beset off Cape Lockyer. On this day, the 17th, the readings of the dry-bulb averaged 24·1°, while the sea surface-temperature averaged 30°, both being the lowest reached during the cruise. A strong southerly wind blew all day.

On the 18th the wind went round to the north, bringing mild weather, and fog or mist. During this and the following two days we made a little over 20 miles to the westward. On the afternoon of the 19th, I had an opportunity of observing a small berg turn half over within 25 yards of the boat in which I was. Though a considerable disturbance was caused, we received no damage beyond a wetting. During the afternoon of the 20th, which was marked by brilliant sunshine, a great number of the yellow seals were seen in the water, moving in an easterly direction. Our position at noon on the 20th was lat. 62° 32′ S., long. 54° W.

During the next three days our position was not materially altered, only some 15 to 20 miles being made to the southward. On the 23rd our position was 62° 43′ S., 54° 9′ W. On the night of the 23rd we had very heavy rain, which froze as it fell, coating everything—ropes, boats, decks, etc.—in a sheet of transparent ice. The barometer fell nearly half an inch during the 23rd—the midnight reading being 28·778 inches—and continued falling until shortly before 8 a.m. of the 24th, when it stood at 28·660 inches. The wind rose from the S.W. to a moderate gale, but fell again as the afternoon wore on. At 11 a.m., on February 24, with the *Diana* in company, steam was started for the Falkland islands, on our way home. Our position at noon was lat. 62° 45′ S., long. 54° 18′ W. On the 25th we found ourselves in 62° 15′ S., 55° 16′ W.; and on the evening of the same day we sighted Aspland and O'Brien islands—belonging to the South Shetlands—out to the north-east. On this day, too, we saw our last iceberg.

On February 26 we again saw albatrosses for the first time since November 17, our position being lat. 60° 37′ S., long. 56° 43′ W. After a somewhat stormy passage of nine days, we anchored in Port Stanley, Falkland islands, on the evening of March 5, having been absent from them exactly twelve weeks. After a pleasant though somewhat slow voyage home, we landed in Dundee on June 11, 1893.

ANCIENT TRADING CENTRES OF THE PERSIAN GULF.

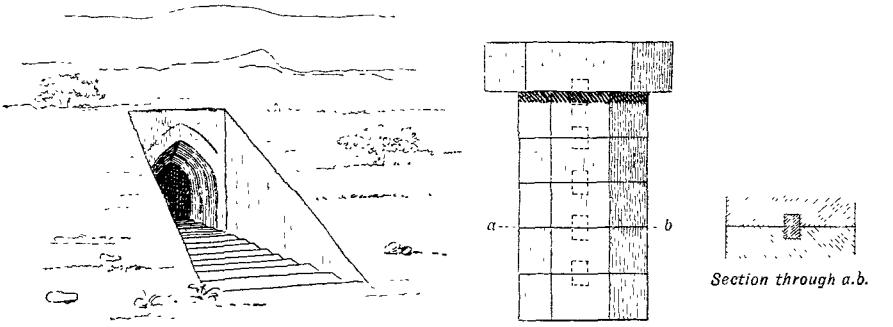
By Captain ARTHUR W. STIFFE. R.I.M.

II. KAIS, OR AL-KAIS.

THIS island, the successor of Siráf and predecessor of Hormuz as an emporium of trade between the West and East, lies off the Persian coast of the Persian Gulf, from which it is separated by a fine navigable strait 9 miles wide. It is of low appearance and convex profile, rising gradually from a rocky shore to a height of 120 feet above the sea in the centre. The length from east to west is 8½, and its breadth 4½ geographical miles. It contains at the present day many small villages, and a large one called Máshi, standing on the north-east corner, lat. 26° 34′ N., long. 54° 2′ E. Máshi is inhabited by about 500 Arabs of the Al 'Ali tribe, who are all pearl-fishers, and send out a large number of boats to the banks, which lie off the Arab coast. It is built of the usual Arab houses of mats made of the stalk of the date fronds, with two square masonry castles, and is nearly a mile in length along the beach. The other villages are also inhabited by Arab pearl-fishers, but have only a few boats each. There is some cultivation, especially on the north coast, with scattered small plantations of date and other fruit trees. On the island also are large flocks of sheep and goats, and some cattle. The interior of the island is rocky and barren, sparsely grown with stunted shrubs and herbage, on which the flocks feed. We visited the island several times in 1857 during the survey. This island, in common with all the others in the gulf, suffered severely from the depredations of the Joasmi pirate Arabs in the beginning of the century, when they were mostly depopulated, and have been only gradually reoccupied since the establishment of British supremacy. It now belongs to Persia, and was then subject to the chief of Chárek.

Near the centre of the north coast are the extensive ruins, now known to the people of the island as Haríra, of the old city, once the head-quarters of the trade with the East. They extend half a mile along the shore, and consist chiefly of mere mounds of stones and fragments of masonry, and the ground is strewn with fragments of pottery and Chinese porcelain, of which latter I have placed some in the British Museum. Of the large mosque some remains exist. A fine minaret of well-cut stone, which was standing only a few years before our visit, lay in heaps of ruin. The fallen pillars of the mosque lay around just as they had fallen; they were of cut stone, octagonal in section, and the several courses had a hole through the centres, evidently for the purpose of dowelling them together. There are several large water-cisterns of oblong shape, which had been roofed in, but the arched roofs had fallen in, partially filling up the cisterns with the *débris*. Two of these measured each 150 feet by 40, and

were still 24 feet deep. They were lined with masonry inside, and cemented. Near these begun a fine kanát,* or subterranean aqueduct, of better execution than those generally seen at the present day. It was cut in the solid rock, and carried at a depth of 20 feet or more from the surface; there were about forty shafts, 15 to 20 yards apart, so that its length was nearly half a mile. Four of these shafts (see sketch) had steps cut in the rock, 4 feet wide, to descend by. There were twenty-three steps in one that I descended. The bottom of this aqueduct was partly choked with rubbish, and there was no water in



it. The pointed vault over the steps, cut out of the rock, was 9 feet high.

There are ruins of smaller extent at other points on the north coast of the island. We could not find or hear of any inscriptions, or of coins being found. The stone of the island is not very durable—a coarse shelly calcareous breccia of probably late Tertiary age.

The ruins are thus much less extensive than those at Siráf (Tahiri); indeed, the prosperity of the city was, as we shall see, not of long duration. The plan shows the position of the town, and the sketch one of the staircases leading to the kanát. As there is no harbour in the island, the anchorages being open to one or other of the prevailing winds, the "ships" were probably hauled up on the beach, or inside the reef, as they seem to have been of small burden; or, in certain seasons, they may have anchored off the north-east point, which is a safe anchorage except in the winter easterly gales.

Of the history of this place, only scanty fragments have been handed down to us. Sir W. Ouseley † relates a curious legend which he considers, on the authority of a Persian manuscript, may be assigned to the tenth century, as to the first settlement on the island. It sets forth how one Kais, a son of a poor widow of Siráf, embarked for India

* A kanát is made by sinking a line of pits to the water-level, and connecting them at the bottom by short tunnels, the bottom being slightly inclined to allow the water to flow along it

† 'Travels in Various Countries of the East, etc., in 1810–12.' London: 1819.

with his sole property, a cat. He arrived there at a time when the king's palace was so infested by mice or rats, that they invaded the king's dinner-table, and persons were employed to drive them from the royal banquet. Kais produced his cat, the noxious animals soon disappeared, and magnificent rewards were bestowed on the adventurer of Siráf, who returned to that city, and afterwards, with his mother and brothers, settled on the island, which from him has been denominated Kais, and so on. I doubt whether much importance can be attached to this myth, which may possibly be the original of the similar English tale.

The island is not mentioned in Ebn Haukal's geography (middle of tenth century), and the earliest reference to it which I have been able to find is in the Sefer Nameh,* where the name only of the island is given in the text, but in a note the learned translator says, "Ibn Moujávir,† in his 'Tarikh Mostanssery,' has a chapter on the island. He says it is of 3 square farsangs, abounds in date trees and plantations of Garazh" (probably the hardy acacia called Ghâf at the present day), "the property of the king. It is sufficient to make a hole with the hands in the sand to obtain fresh and pure water. A subterranean canal" (see description, *ante*), "dug by the kings at a former period, runs through the garden of the prince, fed by water coming from springs and streams, and it fills the reservoirs. The houses in stone and plaster are very high, as much as seven stories,‡ and each one is a fortress." The island owes its name, "according to some, to Qais-ibn-Moulawah, others to Imr-el-Qais, but the most correct is that which attributes it to Qais-ibn-Zobair. The prince of Qais has neither cavalry nor infantry; all the people of the island are mariners. They eat only fish pounded (pilé) with dates. The king has a monopoly of building stone (grès) and bambcos."

Rabbi Benjamin, of Tudela § (A.D. 1164 to 1173), apparently visited the island, but his account is not very intelligible, as he was not a geographer. It appears he sailed from the Tigris, "which runs into the Indian sea, or Persian Gulf, and passes the island Nikrokis." This name has given rise to various conjectures. One commentator explains it Nikra = called, Kis = name of island; however this may be, it is doubtless meant for that place. He says the island is six days' journey in extent (an exaggeration); has only one canal of fresh water, and they gather water during rain in cisterns; the land is not cultivated; and he goes on to say, "This island is famous for commerce with India and the

* 'Sefer Nameh.' By Nassir Khosran, 1035-42. Traduit per Ch. Schefer. Paris: 1881.

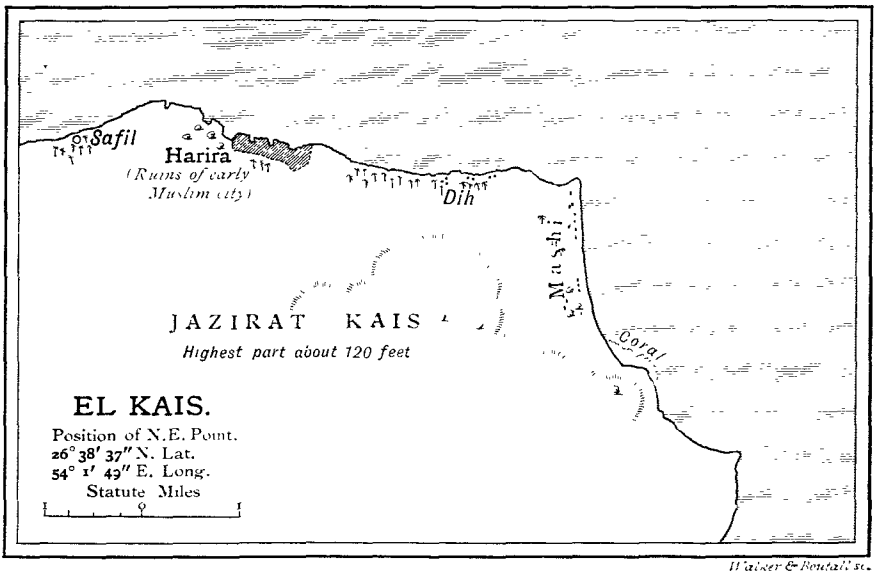
† This author, whose full name was Jemal-ed-din Abul-Fath-ibn-Yakoub-el-Dimichqy, composed a treatise of geography in 1226-42, dedicated to the Kaliphah Abu-Jafar-Mansur-Mostanssr. I give the abstract of M. Schefer's quotation here, although, in point of time, the author is later than Yakút.

‡ Such high buildings of many stories may be seen at the present day, as at Linga; they are an Arab type of building.

§ Kerr's Collection

islands of the Indian sea and Sennar (China?), Arabia, and Persia. The traveller thence went to Katíf, and so on to India and Ceylon."

I have not been able to discover the date of the original settlement of this place, but conjecture there was some settlement here from the Arab coast before 1100 A.D., and that it grew into predominance when Siráf was abandoned, as I have elsewhere suggested, after 1200 A.D. Yakút al Rumí, whose book * dates from 1218 A.D., refers to it as a fine and picturesque island surrounded with gardens and houses. He continues, "In this isle are the vessels which trade with India; there are numerous cisterns supplied by rain-water, and good, well-stocked bazaars. It is



the residence of the King of Oman, who is respected by the sovereigns of India on account of his naval strength and riches, and all the neighbouring isles belong to Kisch. His features are Persian, and costume that of Deilim" (a port in the north-east angle of the head of the gulf). He also mentions the pearl fisheries. It is stated that Yakút personally visited this place, as also Siráf, which latter he found almost deserted.

Edrisi,† whose book dates from the latter half of the thirteenth century, states that the trade of Sohar with China sea "has now ceased." Sohar is in the Arabian country of Oman, formerly of importance, and still existing as a port. He assigns the following as a reason: "A certain governor of Yemen possessed himself of an island called Kish, in the centre of the Persian Gulf, and opposite to Maskat"—this is not

* 'Dictionnaire geogr. de la Perse, from Yaqout.' By C. Barbier de Meynard. 1861.

† 'Geographie d'Edrisi.' Translated from Arabic into French, with notes, by P. Amédée Jaubert. Paris: 1836.

correct—"fortified and peopled it, and equipped a fleet, by means of which he became master of the littoral of Yemen. He did much damage to trade and merchants, plundering them so that the commerce was diverted to Aden. With his fleet he ravaged the coasts of Zenj (Zanzibar) and Ghamran. The inhabitants of India fear him, but resist him with vessels called el-Mechiât, which, although made of a single piece of wood, are capable of carrying up to two hundred men." Large canoes, carrying about thirty men, are at the present day in use at some places on the Arab coast, but the above number is doubtless an exaggeration. The account then continues, "The governor of Kish is reported to have fifty of these vessels, all of one piece, besides many others. He still continues his depredations, and is very rich. At Kish are cultivated fields, cattle, sheep, vines, and pearl fisheries." The account, however, gives the distance of the isle from Sohar as two days' sail, and *one* from Maskat, which is incorrect.

Abulfeda, in his geography (translated by M. Reinaud, 1848), which dates from 1273 to 1331 A.D., mentions the island, "between Ind and Basrah," also the pearl fishery, and says there are many orchards and palm trees and water in wells, and that "the people are well brought up and behaved;" but he says nothing about the town or the trade.

The account of Ibn Batuta (1325–54 A.D.) is to me unintelligible, except on the assumption that he confuses Siráf and Kais, and has compiled a description from other sources than personal knowledge.

Sir W. Ouseley (*op. cit.*), who went up the Persian Gulf in H.M.S. *Lion*, and anchored on the north side of the island, but did not land, says that Zakaria Casvini (who died in A.D. 1275) states that the town is of pleasing appearance, with a castle and many gates, gardens, and various structures, "so that it is one of the most delightful places in our time," and that the island was the resort of ships from Persia and Arabia for commercial purposes. Hamdallah Cazvini, a writer of the following century, mentions it in similar terms.

Further on, Ouseley states that Ahmad al Ghafari records that the prince of Hormuz (which town then stood on the mainland), Shehab-ad-din Ayáz, purchased the island of Gerun (Hormuz) from the kings of Kish, and began to build there about A.D. 1302.

This is confirmed by Mirkond's history,* where it is stated that the name of the king of Keys was Neyn, and that all the islands in the Gulf of Persia belonged then to Keys. This history, which was written before 1378 A.D., says that Keys, so called by the Arabs and Persians, is a small island, once the head of a kingdom, though now not inhabited, "since the trade has fallen off for fear of certain pyrates continually infesting that sea." It formerly had "all the trade that has since been removed to Harmuz." The building of the city on the island of

* The history of Persia, etc., to which is added an abridgment of the lives of the kings of Hormuz . . ., now rendered into English by Capt. Jno. Stevens, 1715.

"Harmuz" is given as 1302, under King Ayaz. The next king of Hormuz, Gordon Shah, was soon at war with Neyn, king of Kais; he was assisted by the governor of Shiráz, and after varying fortunes Kais was reduced to subjection about 1320 under his successor, Mir-sha-Kodbadin, from which date I can find no mention of it, so that it may be presumed to have lapsed into insignificance.

I take the following information from Hammer-Purgstall,* referring to an earlier war with Hormuz. He begins by stating that the most brilliant of the conquests of Abubekr (the Attabeg king of Persia) is that of the island Kais, or Kish, and Bahrein. The first of these islands is called after Kais, one of three sons of Kaissar, a shipowner of Siráf, the haven and emporium of the Southern Persian coast. [Then follows the story of the cat, nearly as already given.] The sons of the widow became mighty shipowners, and extended their operations to the coasts of India, etc. They built on Kais a great palace, which they called Aferide, and which rivalled the palace of Adhad-ed-Doulat at Naband,† and the Hall of Columns, attributed to the same person, at Siráf. The Khalífah, Nassir-ed-dín-illah, gave them the lordship of Kais with the title Sultan-ibn-al-Malik-Jamshíd. Thus the Beni-Kaissar, whose very existence, as well as that of the Beni-Amara in Fars, has escaped European historians, reigned on the island of Kais, until Seyf-ad-din-Abu-Nadhr-Ali-bin-Kaikobad, the lord of the island Hormuz,‡ offered the Attabeg king of Fars his assistance in the conquest of Kais in A.D. 1229. The commanders of the Garmsír (the hot coast of Persia on the gulf) were ordered to subdue Kais, and the Malik Jamshíd was killed. This war is represented in Mirkhond's history (*vide ante*) as a merely domestic war between Kais and the Hormuzians, which latter did not retain possession of the island, although it was overrun by them under Seyf-ad-din, as already stated, at a later period.

DIAGRAM FOR DETERMINING THE PARALLAXES IN DECLINATION AND RIGHT ASCENSION OF A HEAVENLY BODY, AND ITS APPLICATION TO THE PREDICTION OF OCCULTATIONS. §

By Major S. C. N. GRANT, R.E.

THE diagram was designed for the purpose of obtaining rapidly, and with some degree of accuracy, the parallaxes in declination and right ascension of the

* 'Geschichte der Ilchane.' Von Hammer-Purgstall. Darmstadt: 1842. I have somewhat modified the German orthography, as *j* for the cumbrous *dsch* (the only way of expressing the sound in German).

† A village where there are many ruins, situated to eastward of Siráf.

‡ This is a mistake; Hormuz was *not* at that time on the island. I do not find the authorities given throughout in von Hammer's history; it is doubtless in part from Wasáf.

§ Diagrams, p. 688. Separate copies of this paper with the diagrams mounted may be obtained by application at the Society's rooms.

moon, and the practical use to which the parallaxes, so obtained, were put was that of predicting the elements of occultations of stars by the moon preliminary to making observations for the determination of longitude.

The generally accepted systems, both theoretical and graphic, of calculating the local elements of occultations are somewhat long and tedious; whereas the system to be described in these notes is rapid, simple, and sufficiently accurate for practical purposes.

The diagram itself represents an orthographic projection of the Earth, showing parallels of latitude and hour circles; the line OO represents the projection of the equator, and the projections of the parallels of latitude are drawn at intervals of 5°. The divisions on the circumference of the circle, however, give the positions of parallels to each degree, and as the intervals between these divisions can be divided into four parts, latitude can be plotted to 15′.

The hour circles are drawn only on the eastern half of the circle, and a portion of the north-west quadrant. They are numbered in two ways—one from O at the centre to VI. at the east circumference; and the other from O at that circumference to VI. at the centre, and continued to VII. and VIII. beyond the centre. The use of these two systems of numbering will be explained hereafter. Where the space permits, the intervals between the hour circles have been subdivided into spaces representing five minutes; the hour nearest the circumference is divided only into spaces of fifteen minutes. Near the centre of the circle these divisions can be subdivided by eye into five parts, each part representing one minute, which may be taken as the limit of accuracy to which the hour angle can be plotted, and consequently need be calculated. The accuracy, however, decreases as the divisions become smaller near the circumference and in high latitudes.

In the south-west quadrant, the radius of the circle and the radii of all the declination circles up to 32°, the limit of the moon's declination, are divided into scales of one hundred parts.

To determine Parallax in Declination.

Rule—Plot on the diagram the position of the place of observation from its known latitude and the hour angle, counting the hour angles from *right to left*—that is, from the circumference towards the centre. Call this point A. Draw a straight line through the centre of the circle and that division of the circumference representing the moon's declination, above or below the line OO according as the declination is north or south, and in the same side of the circle as that from which the hour angles commence to count. Denote this line by CB.

The length of the perpendicular drawn from the point A to the straight line CB, produced if necessary, is a measure of the parallax in declination. With a pair of compasses, find what proportion the length of this line bears to the radius of the circle, which is divided into a hundred parts on the diagram; multiply this proportion by the horizontal parallax of the moon, and the product is the parallax in declination.

Let us take an example—

Latitude, 10° 30′ N.; moon's declination, 20° 50′ 30″ N.; moon's horizontal parallax, 59′ 16″; hour angle, 1h. 40m.

On the diagram the point A is plotted at lat. 10° 30′ N., and hour angle 1h. 40m., counting the hour angles from the circumference towards the centre as numbered in the lower line of figures. CB is drawn through the centre C and the division on the circumference representing the declination 21° N. approximately.

If the diagram represents an orthographic projection of the Earth on a vertical plane passing through the centres of the Earth and moon, the point A and the

line CB are the projections of the place of the observer and of a line joining the centres of those two bodies.

AD, being the perpendicular dropped from A on to BC, is a measure of the parallax. The length of AD is found on actual measurement to equal $\frac{15}{100}$ of the radius FC of the circle; so that—

$$\begin{aligned}\text{Parallax} &= \tfrac{15}{100} \times \text{horizontal parallax} \\ &= \tfrac{3}{20} \times 59' 16'' \\ &= 8' 48''\end{aligned}$$

Were the declination south instead of north, the parallax would be represented by AD′; this equa's $\frac{49}{100}$ of the radius, and the parallax would equal—

$$\tfrac{49}{100} \times 59' 16'' = 29' 0''$$

In some cases the hour angle may exceed six hours, and the line of the moon's declination may require to be produced through C; for instance, the line EF represents the parallax in declination under the conditions—latitude, 45° N.; hour angle, 6h. 45m.; declination, 30° S.

The Sign of the Parallax in Declination.—If the place of observation as plotted in the diagram is below the line drawn through the centre and the declination, the effect of the parallax will obviously be to move apparently the position of the moon towards the north; it will thus increase north and decrease south declination. The converse is also true. Thus, in the first example the parallax represented by AD would be added to the moon's north declination; that by AD′ would be added to the moon's south declination; and that by EF would be added to the moon's south declination.

Parallax in Right Ascension.

The diagram now represents a similar projection on a vertical plane at right angles to the former, and the hour angles should be plotted from the vertical line passing through the centre of the circle, and counted as numbered in the upper series of figures. If from the point plotted by latitude and hour angle a perpendicular line be drawn to the centre vertical line, the length of this perpendicular is a measure of the parallax; but instead of being, in all cases, measured on the radius of F C of the circle, as in finding the parallax in declination, it should be measured on the scale of the radius of that declination circle representing the moon's declination. These radii for declinations from 0° to 32°, which covers the range of the moon's declination, are divided each into one hundred parts in the south-west quadrant of the figure. The proportion of the perpendicular to the radius of the particular declination circle, multiplied by the moon's horizontal parallax, is the parallax in right ascension.

Both parallaxes will be in terms of arc or time, according as the horizontal parallax is stated in arc or time.

Let us take, as an example, the same values as those in the first example of parallax in declination. The point G represents the place of the observer plotted at latitude 10° 30′; whether north or south is immaterial, and 1h. 40m., the hour angles being counted, as before explained, from the centre outwards. GH, the perpendicular let fall from G on to the centre meridian, is a measure of the parallax. The moon's declination is practically 21°, and so GH is measured on the scale JK, and equals forty-five parts, so that—

$$\begin{aligned}\text{Parallax} &= \tfrac{45}{100} \times \text{horizontal parallax} \\ &= \tfrac{9}{20} \times 59' 16'' \\ &= 26' 36'' \text{ (arc)} \\ &= 1\text{m. } 46\text{s. (time)}\end{aligned}$$

Sign of the Parallax in Right Ascension.—If the sidereal time at place exceeds the moon's right ascension, that is, if the moon is to the west of the meridian, the effect of parallax is to decrease the moon's right ascension. The converse is also true.

The most convenient way of using the diagram is to cover it with a piece of tracing-paper, and to draw a line on the tracing-paper across the diagram at the latitude of observer's station. Place a ruler to represent the line joining the centres of the Earth and moon. Then with one leg of a pair of compasses on the point at which the hour circle cuts the latitude line, adjust the other leg so that, when swept round, it touches the edge of the ruler in one case, or the central meridian in the other; the compasses are then open to the length of the perpendicular, and the proportion to the particular radius can be scaled off at once. These proportions can be conveniently multiplied by the horizontal parallax by means of a slide rule.

The Nautical Almanac gives the elements of occultations as they would be seen from the centre of the Earth, and although the limits of latitudes between which the star may be occulted are stated, this does not mean that the star will be occulted as seen from every place within the limits stated, but rather that outside these limits the star cannot be occulted. Again, although an occultation may be visible, the star's apparent path may so approach a tangent to the moon's disc as to render the results obtained from the observation of such an occultation unreliable. The time of occultation may, owing to the effects of parallax, be any time from about two hours before to the same interval after the time of conjunction as given in the Nautical Almanac. These circumstances render it desirable to determine, before attempting to observe an occultation, whether the star as seen from the observer's station will be occulted at all, and if so, at what time approximately it may be looked for, and at what portion of the moon's disc the star will disappear and reappear. The simplest way of doing this is to draw to scale the position of the star, and relatively to it the path of the moon as affected by parallax.

A form showing the small amount of calculation necessary is given on p. 653.

In the instance worked out, the G.M.T. of geocentric conjunction is 17h. 48m. 18s., and the calculation is commenced with the view of finding the parallaxes at 17h. and 18h. so as to plot the position of the moon at those two times, and from those positions as plotted, to draw the path of the moon's centre. Before we can plot the parallaxes off the diagram, the hour angles must be determined, and the first portion of the calculation is for this purpose. The hour angle at 17h. is found to be 1h. 48m. 40s., and since the sign is + the moon is on the west of the meridian. This, according to the rule before stated for the sign of the parallax in right ascension, throws back the moon in right ascension, and, as far as the effect of that only is concerned, delay the time of conjunction; so that we may infer that this time, instead of being between 17h. and 18h., will probably be between 18h. and 19h., and it will consequently be better to plot the position of the moon at those hours, and the hour angles for those two times are noted down. It is not necessary to recalculate the hour angles, but for each difference of one hour of G.M.T. add *algebraically* about 58m. to the hour angle. That is to say, when the moon is on the west of the meridian the hour angle may be considered positive and is increasing, and when the moon is on the east of the meridian the hour angle may be considered negative and is decreasing.

The moon's horizontal parallax and semi-diameter are next taken from the N.A.; they should be corrected approximately to time of occultation.

The remainder of the calculation consists simply in applying the parallaxes, scaled from the diagram, to the right ascensions and declinations of the moon taken from the N.A., and in taking the differences of the right ascensions and declinations

as well as those of one of the positions of the moon and of the star. These differences are taken out only to facilitate plotting the relative positions on a figure or drawing. See that the right ascensions and their parallaxes are stated both either in time or in arc. The figure (p. 688) is constructed as follows:—A is taken as the position of the moon's centre at 18h. G.M.T., and relatively to this B represents the same at 19h., and S that of the star. B and S are plotted from their differences of right ascension and declination from A. A circle described with S as centre and radius equal to the moon's semi-diameter, cuts the moon's path at D and E; these two points are positions of the moon's centre at the times of disappearance and reappearance respectively. Should this circle fail to cut the line of the moon's path, it shows that no occultation will take place. The moon passes over the distance A B in one hour, and if we assume its motion uniform, we have the time the moon takes to travel over AD $= \frac{AD}{AB} \times 60m.$ Measure the lengths of AD and AB on any scale convenient, and—

$$\text{Time AD} = \frac{27}{122} \times 60m.$$
$$13m.\ 17s.$$

So that the G.M.T. of disappearance is 18h. 13m. 17s., or, corrected for longitude, 10h. 43m. 17s. local time.

Similarly, $\frac{BE}{AB} = \frac{41}{122}$, and $\frac{41}{122} \times 60m. = 20m.\ 10s.$, so that G.M.T. of reappearance is 19h. 20m. 10s., or 11h. 50m. 17s. local time.

As regards the angles: if DF and EG be drawn vertically, or rather in the same direction as the differences in declination have been plotted, then the angles FDS and GES are the angles, from the north point of the moon's disc, of disappearance and reappearance respectively; if these be reckoned from the north towards the east, we have the former 4° and the latter 305°.

The most convenient way of drawing the figures is on what is known as logarithm paper, ruled with blue or red lines into squares. If these lines are drawn about a quarter of an inch apart, and each division is taken to represent one minute of arc, a figure can conveniently be drawn on half a sheet foolscap size.

After a very little practice, the calculations of hour angles, scaling off the parallaxes, and drawing the diagram can all be done in from a quarter of an hour to twenty minutes, and if done with only a moderate amount of care, the error of the time either of disappearance or reappearance arrived at should not exceed ten minutes. The mean error of a large number worked out by myself, or under my supervision, was 4·5m. The angles, however, should differ only a degree or two from the correct angles of ingress or egress respectively.

DATE—JANUARY 16, 1894. STAR, 9 TAURI.*

Lat. 20° 30′ S ; *approx. Long.* 112° 30′ W.

	h.	m.	s
G.M.T. of conjunction	17	48	18
Sidereal time, G.M.N.	19	43	38
Correct for 17 hours	17	2	48
Sidereal time at Greenwich	12	46	26
Correct for longitude	7	30	0

* In the Nautical Almanac for 1896 a change has been made in the arrangement of the elements of occultations.

	h.	m.	s.
Sidereal time at place	5	16	26
Right ascension of moon	3	28	46
Hour angle at 17 hours G M.T.	1	47	40
„ 18 „	2	45	0
„ 19 „	3	42	30

Moon's horiz. parallax ... 59′ 39″ Semi-diam. ... ... 16′ 16″

	Moon's right ascension. h.	m.	s.		Declination. °	′	″
18 hours	3	31	13	N.	22	33	29
Parallax		−1	45			+35	45
	3	29	28		23	9	14
19 hours	3	33	42	N.	22	44	18
Parallax		−3	22			+31	18
	3	30	20		23	15	36
Difference in time			52s.				
„ arc		13′	0″			6′	22″

	h.	m.	s.		°	′	″
Star's right ascension	3	30	44	Declination	22	51	47
Moon at 18 hours	3	29	28		23	9	14
Difference in time		1	16				
„ arc		19′	0″			17	27

THE MONTHLY RECORD.

THE SOCIETY.

Honour to the President.—The Fellows of the Society will be pleased to learn that the honour of Knight Commander of the Bath has been conferred by Her Majesty upon our President, Clements R. Markham, C.B., for his long and distinguished services to geography.

Royal Medals and other Awards for 1896.—The Royal Medals for this year for the encouragement of geographical science and discovery have been awarded as follows: The Founder's Medal to Sir William Macgregor, K.C.M.G., for his long-continued services to geography in British New Guinea, in exploring and mapping both the interior and coast-line, and giving information on the natives. The Patron's Medal to Mr. St. George R. Littledale, for his three important journeys in the Pamirs and Central Asia. The Murchison Grant has been awarded to Yusuf Sharif Khan Bahadur, Native Indian Surveyor, for his important work in Persian Baluchistan and elsewhere; the Gill Memorial to Mr. A. P. Low (of the Canadian Survey), for his five explorations in Labrador; the Back Grant to Mr. J. Burr Tyrrell (of the Canadian Survey), for his two expeditions in the Barren Grounds of North-East Canada; the

Cuthbert Peek Grant to Mr. Alfred Sharpe, for his journeys during several years in Central Africa. The following have been elected honorary corresponding members—M. P. de Semenoff, Vice-President of the Russian Geographical Society; Professor Dr. Karl von den Steinen, President of the Berlin Geographical Society; Professor Dr. G. Neumayer, Director of the Naval Observatory, Hamburg; Professor A. de Lapparent, late President of Council of the Paris Geographical Society; Dr. Albrecht Penck, Professor of Geography in Vienna University; Professor Dr. Otto Petterson, of Stockholm, the distinguished oceanographer; Professor Dr. Kan, President of the Dutch Geographical Society; Sr. D. Ernesto do Canto, of São Miguel, Azores, who has edited a series of the Archives of the Azores; Professor H. Pittier, Director of the National Physico-Geographical Institute of Costa Rica.

Legacy to the Society.—The late Mr. William Chandless, a gold medallist of the Society, whose death we regret to record, has left the Society a legacy of £500, free of duty.

EUROPE.

Glaciation and Lake-Basins of Subalpine Switzerland.—At a recent meeting of the Geological Society of London, a paper was read by Dr. C. S. du Riche Preller on 'The Pliocene Glaciation, Pre-Glacial Valleys, and Lake-Basins of Subalpine Switzerland.' The main object of this paper was to solve the problem whether the Pliocene glacio-fluviatile conglomerates of the Swiss lowlands were deposited on a plateau or in already existing valleys. For the purpose of this inquiry the author examined last summer a large number of additional glacial high- and low-level deposits throughout the Zürich valley over an area more than 40 miles in length; and his investigations led him to important conclusions with respect to the combination of causes which determined the formation of the lake-basins lying in the same zone at the foot of the Alps. The author contended that at the advent of the first glaciation the Zürich valley was already eroded. In his view the isolated high-level deposits were formed during the intermittent shrinkage of the upper Pliocene ice-sheet, while the low-level deposits were formed during the subsequent recession of individual glaciers left in the several valleys. He further adduced evidence that the Subalpine valleys of the Reuss, Aar, and Rhine were likewise excavated before the first glaciation. The author showed that the Lake of Zürich owes its origin, in the first instance, to a zonal subsidence (probably between the first and second glaciation) of about 1000 feet. During the second and third Ice-periods the original lake-basin was gradually filled with glacial and fluviatile deposits at both ends, and was finally restricted to its present dimensions by a post-Glacial bar deposited at its lower end by a tributary river. In the author's view the other subalpine lakes, extending from the Lake of Constance to Lac Bourget in Savoy, owe their origin and present limits, in the main, to the operation of similar causes.

Lake Peipus.—M. Venukoff gives in the *Comptes Rendus* of the Paris Academy of Sciences (vol. 122, p. 1078) a short account of the observations made by M. Spindler in Lake Peipus, a lake which overflows by the Narova river into the Gulf of Finland. Although the lake is nearly as large as that of Geneva, it is only 44 feet in depth, and its variation of level with the season is about 4½ feet. The water is very muddy, and the bottom is invisible at a depth of 7 feet. The lake

abounds with fish, the number of which seems to be increasing, although fishing is actively carried on.

ASIA.

Caucasian Travels of Dr. Abich.—Mr. Douglas W. Freshfield writes:—Dr. Abich was one of the German men of science who found employment and a field for scientific inquiry under the auspices of the intelligent administrators who fifty years ago directed the Caucasian government. A man of science more than a man of letters—in the technical sense of the phrase—he produced a mass of valuable technical treatises on Transcaucasian geology, but no popular or complete work. The voluminous correspondence now published consists almost entirely of family letters, ranging from the year 1842 down to 1874. But though addressed to his nearest relations, Dr. Abich's collected correspondence is in reality a diary of his wanderings and a notebook of his scientific observations and conclusions. Before 1850 Dr. Abich, in his capacity as an official, had been able to penetrate many of the mountain fastnesses at the foot of the great peaks which have lately become objects of attention to our countrymen. He realized the true character of the chain, and he describes in these letters, in simple but graphic terms, its characteristics. It is strange that he should have allowed these descriptions to remain buried for fifty years in an unpublished correspondence, while the best European works of reference were supplied with the most erroneous details as to the region in question. He evidently was equally without the phrasemaker's and the bookmaker's ambition. He seldom—and this will be the chief fault found by lovers of Nature with his letters—stops to depict a scene. He sums up the characteristics of Suanetia in a few appreciative sentences; but he brings back no particular landscape to our memory, and he certainly will suggest none to those who have not ventured into this region. Not to waste more space in analysis, Dr. Abich was in no sense an artist, but he was an observer, and what is much more, an original and independent thinker. His pages are interspersed with shrewd axioms and criticisms, as well as with clear statements of physical facts, and these are no sooner made than they are put to use as ethnological material for the explanation of the distribution and the characteristics of the various races that inhabit the mountains. Owing to its form, the valuable material scattered up and down this work is hard to piece together and use; the letters are a maze without a plan or an index; but they will repay perusal, and they must form an indispensable addition to the Caucasian shelf in every public library. They recall many stirring past episodes of warfare as well as the more commonplace mishaps of mountain traveller. There is no doubt that Dr. Abich, had he taken the trouble, might have produced a work on the Caucasus which, if it did not result, as he was led to believe on his visit to London in 1868 such a book might, in a profit of "several thousands of pounds," would have taken a high place among popular books of travel. It is satisfactory to find how completely in accordance Dr. Abich is in his observations and remarks with the English mountaineers who have succeeded him as explorers of the Caucasus.

The Brothers Grum Grjimailo's Journeys in East Tian Shan.*—We have before us one more volume of the admirable quarto series published by the Russian Geographical Society, and devoted to the reports of its expeditions to Central Asia. This last volume, edited with the same luxury as the preceding ones, is the first of a work in two volumes, which will contain the records of the journeys of the two brother explorers in West China, and it embodies their explorations in the Eastern Tian Shan. The expedition started in May, 1889. Its

* "Description of a Journey to West China," by G. E. Grum Grjimailo, with the aid of M. E. Grum Grjimailo. Vol. i. Along the Eastern Tian-Shan. St. Petersburg, 1896, 4to, 547 pages

primary aim of exploring the southern slopes of the Pamirs had to be abandoned, and the Eastern Tian Shan, as well as the Nan Shan highlands, were taken instead. The party, consisting of the two brothers, accompanied by eleven cossacks, went first to Kulja, whence it proceeded north-east, across the Min Moral mountains to the Ebi Nor. These mountains suddenly fall on their northern slope from the height of the Tsyterty pass (8490 feet) to the low sandy depression, now occupied by the lake (700 feet). The party's aim was now to recross the Tian Shan, *i.e.* the Boro Khoro mountains, from north to south, and they went from one Taugut encampment to another, vainly asking for a guide. Finding none, they tried to find a passage themselves almost due south of Ebi Nor, but they had soon to abandon their intention. The valley they followed became a mere rent in the mountains, and the stream-bed, which they had to take to, was not only covered with immense blocks of rock, but was also soon inundated by volumes of water rushing from the snow-clad peaks. There are no proper river valleys in that part of the mountains, which form in the east of the Dos-Meghen a short chain of high snow-clad peaks. In their middle course the streams flow in cañons, which are cut through the diluvial deposits, and in their upper course they become mere rents in the rocks. As to the orography of the region, we are inclined to think, from the author's description, that the Khalyk-tau runs north-east, and that it meets with the Iryan-kharbut chain which runs north-west. The Boro Khoro, which evidently has the characters of a border ridge (p. 105), is thickly clothed, in a zone of from 6000 to 9000 feet, by fir-trees. Crossing now several northern spurs of the mountains and exploring every opening, the party made another series of attempts at crossing the main range in the south-south-west of Manas, but were finally compelled to take to the usual caravan route from Manas to Urumchi. Some reward was found, however, in an excursion from Urumchi to the Bogdo-ola lake and peak. The beauty of the scenery around the lake and at the foot of the mountain, which raises its three snow-clad summits to a height of over 12,000 feet, fully explains why the Mongols consider the Bogdo-ola as the seat of deity, and maintain that the lake covers the remains of 100,000 saints. The photographs of the chief mountain and the beautiful morainic lake, taken by M. Grum Grjimailo, and reproduced in the work, well illustrate the impression. From Urumchi the expedition went to Guchen, and therefrom made an incursion into the Jungaria desert, to the well Hashun, in order to secure specimens of the wild horse (*Equus Prjevalski*, Poljakoff) which Prjevalsky so passionately desired, but failed, to obtain. A small herd of seven horses was soon discovered as they came to drink at a small salt lake, but the difficulties of killing two of these most watchful animals, guided by one experienced sire, were very great. They were secured at last, and the fact that we have in Jungaria the real ancestor of our domestic horse is now fully established. Crossing the relatively low and narrow continuation of the eastern Tian Shan, the expedition went next to Hami, and to Turfan, and the pages given to the description of these two oases and their inhabitants will be found full of interest. They ought to be translated into English, as well as, in fact, nearly the whole of the work, which is written very pleasantly for the general reader. The importance of the Turfan oasis as a centre of commerce and administration is especially insisted upon. An important geographical discovery was made in the south of Turfan, when the expedition, exploring the relations between the Tian Shan and the highlands which lie further south, came across the sandy depression of the Assa, near Lukchun, and found that the bottom of this depression, situated between the Jarghoz (Eastern Tian Shan) and the Choltau mountains, lies 170 feet below the level of the ocean. The very low altitude of that bottom of an old lake has now been fully confirmed by two years' observations, made during Roborovsky's expedition. Turning from this depression

southwards, the expedition entered into the exploration of the mountains which may be considered as a link between the above and the highlands of the Nan Shan; but a full discussion of this connection being promised for the next volume, it may be as well to postpone until that time an analysis of the same. A comparison of the map which accompanies this volume with the old maps fully shows to what a considerable extent our knowledge of this part of Central Asia has been increased by the expedition. The map, which covers 4° of latitude (41° to 45°) and 10° of longitude (81° to 93°), is drawn on a scale of 27 miles to the inch, and contains many new and important details. Twenty-five photographs, some of which are most interesting, embellish the volume. Lists of birds (by M. Pleske) and of lepidoptera (by the author), which were brought in by the expedition, are added to this volume, while other collections, all very rich, are still in the hands of specialists.

A Journey from Damascus to Bagdad (*conclusion*).—The second and concluding part of Freiherr von Oppenheim's journey (see above, p. 548 of *Journal*) is contained in the fourth part of *Petermann's Mitteilungen*, 1896. The first part of this second section of the journey lay between the Euphrates and the Upper Tigris, a route which led him past many interesting remains of antiquity. He crossed the Euphrates at Der (Ed Deir) by a bridge connecting the town with an island in mid-stream, and then by a ferry connecting that island with the left bank. He then proceeded eastwards to Sauar on the Khabur, and ascended that river and its tributary, the Jaghjagh, to Nisíbin. The Khabur, a stream which, on account of the rapid fall in its bed and the large number of rapids, it would be difficult to render navigable, is bordered on both banks as high as Heseke (about 34 miles in a direct line from Sauar) by a succession of mounds, on the tops of which are numberless glazed and unglazed potsherds, showing the mounds to contain the buried remains of decayed villages. On the Jaghjagh, about 7 or 8 miles above its confluence with the Khabur at Heseke, v. Oppenheim found the ruins of an old bridge in the course of a road which he regards as identical with that marked on the Tabula Peutingeriana (Segmentum XI.) as leading from Ras el Ain to the Sinjar. Nisíbin, or Nesíbin, he describes as lying in a marshy situation, and subject to visitations of malignant fevers. At this place he was met by a body of retainers of Faris Pasha, Sheikh of the Shammar tribe, and conducted by them to the camp of their chief, to whom his expected arrival had been announced. The tribe over which this chief rules is the most powerful Beduin tribe in Mesopotamia, roaming over the whole of the upper part of that region from the Belich to the neighbourhood of Bagdad, and still holding the smaller nomadic tribes and numerous villages on the borders of the steppe in a kind of tributary relationship, though the Turkish Government has at last succeeded in enforcing on themselves the payment of taxes. Von Oppenheim's route eastward from Nisíbin passed a little to the north of two large mounds, Lelan and Tell Rarase, both said to conceal extensive ruins, and led him to two others not marked in any map, the Tell er Rumélan in 36° 36′ N., 42° 6′ E., and another a short distance to the east. Touching the Tigris at the frequented ford of Havi Zummar in 36° 46′ N., he remained on the right bank of the river and continued his journey, now in a south-easterly direction, towards Mosul, and about 50 miles north-west of that city, near the village of Abu Vajne, came upon the ruins of a hitherto unknown town of considerable size, which must date from the Arabs of the Middle Ages, and must have had a population of 20,000 to 30,000. The remains of this town are in part well preserved, beautiful gypsum columns of a ruined mosque speaking to its former prosperity. The ruins of Eski Mosul, which have the same character as those of Abu Vajne, were also visited. From Mosul, von Oppenheim descended the Tigris to the neighbourhood of Bagdad on one of the usual rafts supported by inflated goatskins. The whole journey on

such rafts seldom takes more than from six to eight days, while the land journey lasts about ten days. No other method of navigation is used on the Tigris above Bagdad. The highest point at which such rafts might be used on the Tigris is uncertain, but the actual limit at which their journeys begin is Diarbekr. The route is now regarded as tolerably safe, while formerly the rafts were frequently fired at, stopped, and plundered, especially by the Shammars. Von Oppenheim was, however, accompanied by an escort of zapties. There are bridges of boats across the Tigris at Jezire (Jeziret-ibn-Omar) and Mosul; the only others lower down are one at Samarra, one just above Bagdad, one at Bagdad itself, and one just below the city. The Turkish Government is now considering projects for the erection of an iron bridge across the river at Bagdad. Freiherr von Oppenheim's account of his journey is followed by an appendix, in which he gives an account of his mode of transcription of Arabic names (not followed in these notes), and an alphabetically arranged list of the places on his route in Roman and Arabic characters.

Phœnician Characters in Sumatra. Their Possible Connection with the Voyages of Nearchus.—In *Archæologia Oxoniensis* (1892-95, part 6) it is pointed out that the existence of characters of pure Phœnician type in Rejang, South Sumatra, described by Marsden in his history of that island, may possibly be due to a voyage of ships of Alexander the Great to those parts, of which written traditions also exist. After the successful voyage of Nearchus and Onesicritus—in ships built by Phœnician shipwrights—from the Indus to the mouth of the Tigris, and the narration by the former of his adventures to Alexander at Susa, a long interval elapsed, during which both captains disappear entirely from the scene. They are heard of again shortly before the death of Alexander, who, according to Plutarch (confirmed by Quintus Curtius), was met by Nearchus on his approach to Babylon, and during his fatal illness heard from him the history of his voyage on the ocean, from which, it is said, he had returned. Although Dean Vincent supposed this to refer to the coasting voyage, it is possible that a second voyage is alluded to, the inducement to which may have been supplied by an account of an Arab pilot, met with (as we know) by Nearchus on the coast of Gadrosia. The Rejang writing—specimens of which, from tablets preserved in the India Office Library, accompany the paper—was accepted as clearly Phœnician both by Professor Sayce and M. Renan, and more recently Dr. Neubauer has attributed it, from the shape of the letters, to the fourth or fifth century B.C. It presents marks of adaptation, which point to Greek influence such as might have been exerted during Nearchus' voyages, and reads, like the Greek of the period, from left to right, although in Sumatra generally, where the writing is Arabic, the reverse is the case. Traditions exist both in Java and Sumatra of the arrival of ships from the Persian Gulf in the time of Alexander, who is said "to have built a bridge across the sea," an expression which may refer to an intercourse established by his ships. Finally, it is worthy of remark that, while two of the characters are Cypriote forms found in inscriptions at Citium, the fleet on the Indus, according to Plutarch, numbered Cypriotes among its crews.

Friar Odoric's Island of Dondin.—A short note by M. Romanet du Caillaud, extracted with modifications from his forthcoming work on the origin of Christianity in the Annamite countries, is published in the *Comptes Rendus* of the Paris Geographical Society (1896, p. 117), on the subject of the identification of the Dondin island of Friar Odoric, which has always been a puzzle to commentators. The suggestion was thrown out by Sir H. Yule that the name might possibly be a misread contraction of "Isola D'Andiman" (the Andamans, with which M. Cordier also is inclined to connect the account), though he also notices that Marco Polo relates a story similar to Odoric's with reference to Dragoian (? in

Sumatra), and that the cannibalism mentioned by Odoric is ascribed by Gasparo Balbi to the kingdom of the "Rey del Dagin," by which Achin is signified. M. du Caillaud thinks the name may be derived from the Annamite form of the Chinese term for the "Province of Luzon" (Lû'-Tông-Tinh), by which the Archipelago might well have been known to those arriving from China and Tongking. He refers to the traces of Christianity found by the Spaniards in the Philippines in the sixteenth century, and thinks that these may be ascribed to the teaching of the Franciscans of the missions founded by John of Montecorvino, especially Odoric. It may be remarked, however, that in Sir H. Yule's opinion ('Cathay,' p. 7) the missionary labours ascribed to the latter appear to be quite unsupported by evidence, no hint of such labours appearing in his travels. M. du Caillaud's explanation of the easterly direction taken in sailing from Dondin to China, seems also not quite satisfactory; but there is every indication of confusion in the sequence of this part of Odoric's narrative, as his description of Ceylon (immediately preceding that of Dondin) comes later than the accounts of Sumatra and Java.

AFRICA.

Mr. Scott-Elliot's Book on Mid-Africa.—In his recently-published account of his journey to Ruwenzori,* Mr. Scott-Elliot, besides giving fuller details respecting the country traversed than was possible in the paper read before the Society last year, devotes several chapters to a discussion of general questions connected with East and Central Africa, such as the climate in its relation to European settlement, the various floras of the country and their origin, the best method of opening up the British spheres, and so forth. In describing the various regions passed through, the author, as a botanist, naturally gives special attention to the vegetation and its conditions of growth. The peculiar character of the Mau forest, with its groups of slender stems resembling in growth the bamboo, with which it is associated, is ascribed to the action of the wind. Other features dwelt on are the papyrus swamps in the valleys of the Victoria Nyanza region; the bare, grassy hills of Karagwe and Ankole; the dry and monotonous plains of the neighbourhood of Lake Albert Edward; and the valleys and slopes of Ruwenzori, with their zones of vegetation. Like the other high mountains of East Africa, the highest peaks of Ruwenzori† are almost perpetually hidden from view by mist, which in the morning covers the lower slopes and appears to rise at the rate of about 1000 feet an hour. The upper limit of forest is given at 9000 feet, of bamboos at 11,000, while the heather-zone reaches to 15,500, at which the snow begins. The highest point is given as 16,700, which, considering the extent of the snow-fields revealed by photographs, certainly seems a surprisingly low estimate. The author lays stress on the importance of the central range of mountains‡ which he crossed before descending to the Tanganyika depression, and which he considers to stretch in a nearly continuous line along the eastern side of Tanganyika, rising to a height of 8000 to 10,000 feet. Not having seen von Götzen's map at the time of writing, he considered that the Mfumbiro peaks formed the northern termination of this range, which, where crossed, did not sink below 7700 feet. The plain at the head of Tanganyika appeared to contract suddenly at 30 or 40 miles from the lake, and it is possible that this is an indication of the position of a waterfall on the Rusizi, first mentioned by Livingstone, and marked on von Götzen's map. As regards climate, four zones of altitude are distinguished: (1) the coconut or oil-palm zone,

* A Naturalist in Mid-Africa. By G. F. Scott-Elliot. London: Innes, 1896.

† The correct spelling is said by Mr. Scott-Elliot to be Runsororo.

‡ Named by Baumann the Central African schistose range.

below 3000 feet; (2) the coffee zone, between this and 5000; the colony zone, from 5000 to 7000; and the cloud-belt, above 7000. In British East Africa, however, the first is subdivided into the wet coast jungle, and the dry region of scrub further inland. The shores of Tanganyika are considered very unhealthy, and the water of the lake dangerous to drink. Botanically, three main divisions only are laid down for all tropical Africa up to the Sahara, viz.: an eastern and western wet region (up to 3500 feet), and a fairly dry central ridge, the higher West African lands north of the Congo being not alluded to. The sudden change from the central to the western flora, on descending to Lake Tanganyika, is very striking. The Ruwenzori region is stated to be a more promising coffee (and tea) district than even the Shire highlands, apart from its present inaccessibility. Mr. Scott-Elliot, as is well known, strongly favours the adoption of the lakes route into the interior, even for parts of British East Africa. For colonies, the Masai uplands and the Stevenson Road plateau are the most recommended. A useful general map is given, showing the zones of altitude. As regards the special map, it is only fair to mention that, apart from corrections of one or two special features, it is really a copy of that published in the *Journal* last year.

Journey from the Niger Delta to the Benin River.—Through the courtesy of the Foreign Office we have been favoured with a copy of a report by Major Copland-Crawford, Vice-Consul at Warri on the western arm of the Niger Delta, on a journey made by him, in January last, from that station to Sapele on the Benin River. The latter place is at the junction of the two main arms of the Benin River (see *Journal*, vol. i. p. 123), and has lately been made the site of a Vice-Consulate. The object of the journey was to ascertain the nature of the country and people with a view to establishing a communication overland between Warri and Sapele. It proved, however, that owing to the amount of water in the rainy season, this route would be unsuitable for a road, but the journey was of use in establishing friendly relations with the people of the district. In order to avoid the head of Kaunusi's Creek a detour was first made to the east to Eferun and Tori, whence the direction was nearly due north. Before reaching Tori a marsh with 1 foot of water in the dry season, and probably 6 to 8 in the rains, had to be crossed. Beyond the town the country assumed the usual aspect of that inhabited by the Sobos, the path leading through bush or narrow belts of trees with cultivated plantations of cassava, yams, ground-nuts, etc., interspersed with oil-palms, on each side. Many dips with water and mud were met with, showing signs of a considerable amount of water in the rainy season. At a fairly large village named Abuga numbers of chiefs from the surrounding country were received, and friendship established. The inhabitants of most of the villages turned out to clear the road for the consul, but at Upay the people not only neglected to do so, but tried to hinder the efforts of the neighbouring villagers. The path about here was bad and beyond Upay ran through low swampy ground. At Adegi the chief, a blind but intelligent and friendly old man, expressed himself desirous of peace, trade, and the friendship of the white men. Other swamps and patches of damp rank bush were passed, some with considerable difficulty, and the path in places was narrow and overgrown, and obstructed by fallen trees, but cultivation was also seen, with oil-palms scattered about. On the second half of the route the country seemed generally lower than that previously passed through. The largest villages, Oquetolla and Odobrassa, had populations of 400 to 500 and 300 to 400 respectively. At the former the chief, Igbama by name, was of good presence and seemed to be a man of importance. He was well dressed in silk. Sapele was finally reached after a march of a little over two days, but if time had pressed it could have been reached sooner.

The New Road from Mombasa to the Victoria Nyanza.—At the end of January last Captain B. L. Sclater, R.E., F.R.G.S., who is in British East Africa as superintendent of communications under the orders of the Foreign Office, had advanced from the coast as far as Fort Smith, Kikuyu, where he had about sixty trained oxen in his two-wheeled carts. He had been lucky enough to get five of his ponies through the fly-district of the coast into the highlands, where they were doing well. From Kikuyu to the top of the Kedong escarpment—about 15 miles—was a tough bit, very broken and hilly and covered with dense forest or thick bush, which would take some time to get through. While this was in progress Captain Sclater was going on to Lake Naivasha to establish a station there. As regards this route generally, Captain Sclater reports the first 180 miles from the coast to be the most horribly dry and scrubby country he had ever seen, the little vegetation being all thorns and euphorbias, and the scanty population being in constant famine from want of water. On reaching the Kibwesi district there are permanent streams rising from under the lava-rocks, and the country improves a little, but is still covered with a dense thorny scrub. Between Kibwesi and Ukambani there are plains partly covered with thorny scrub and partly open grass, but the streams are all more or less salt. Here there are large herds of zebras and wildbeestes, and numerous rhinoceroses still to be met with. The hartebeest, probably *Bubalis cokei*, is plentiful, as are Thomson's and Grant's gazelles. Waterbucks are to be seen on the Kiboko, and a few herds of giraffes are met with. These plains extend far out towards Kilimanjaro, and are broken only by some volcanic-looking cones which stand out in that direction. No doubt the streams of lava came from that quarter also. Ukambani is a block of hills, perhaps 50 miles in length and 20 or 30 miles wide, surrounded by plains, and bordered on the east by the Athi river. It is an almost treeless country, and what trees there are are scrubby and thorny. Yet it is undoubtedly fertile, and well watered by numerous streams, all flowing into the Athi. The natives live for the most part on the tops of the hills, but grow large crops in their gardens in the valleys. They possess large herds of cattle, goats, and sheep, and plenty of fowls. The new road keeps along the western edge of the Ukambani hills. Between Ukambani and Kikuyu lie the Kapté or Athi plains. It had been hoped to carry the road straight across them, but it was found impracticable, the plains being broken up by swamps and covered in places by small blocks of lava. It was therefore found necessary to divert the road round to the east, skirting the Machako hills and crossing the two Athi rivers at the same places as the old caravan route. These plains were formerly the grazing grounds of the Kapté Masai, but the Masai having died of starvation and small-pox after the cattle-plague had carried off all their cattle, the plains have been re-occupied by vast herds of zebras and antelopes, varied by numerous rhinoceroses and ostriches. The soil of these plains, which are from 5000 to 5500 feet above the sea-level, does not appear to be very fertile, but grows excellent short grass. There are, however, many parts covered with loose blocks of lava, especially in the valleys and near the rivers. Kikuyu is on a broad ridge running south from Mount Kenia, and bounded on the west by the Kedong escarpment and on the east by the plains of the Athi and upper Tana. Kikuyu was apparently once covered with dense forest, which still remains all round the edge of the district, but of which the greater part of the centre has been cleared off by the natives for cultivation. Immense crops of potatoes and grain are grown, and there are numerous herds of goats kept and a few cattle. The climate, according to the testimony of the few Europeans who live there, is extremely healthy.

Explorations in the Barotse Country.—Captain Gibbons, who accompanied Mr. Reid and Captain Bertrand in the expedition to the Barotse country, of which a

short account was given in our April number, writes to us from the Nkala mission-station (S. lat. 15° 53′ 26″; E. long. 26° 4′ 00″), giving an account of his journeys after parting with his companions at Kazungula (*supra*, p. 427). During his voyage up the Zambesi to Lialui, he took numerous observations for latitude, and, with the help of a compass survey in addition, hopes to considerably improve the map of this part of the river. From Lialui he struck eastwards, and, after exploring the tributaries of the Lui, came upon a system—that of the Luena—apparently till then undiscovered.* The river is said to disappear in a lake near the Zambesi some 30 or 40 miles north of Lialui, draining subterraneously into the main river. From the source of a tributary of the Luena in 15° 43′ 9″ S. (altitude 3790 feet). Captain Gibbons went south and reached the Njoko at the junction of its two headstreams, the highest point at which there is permanent water at the end of the dry season. After returning to Penda-ma-tenka *viâ* the Njoko and Sesheke, the traveller again went north, exploring the Sejlefula and Majili systems. The station of Nkala, from which he wrote, was only some 8 miles from the Kafukwe, known there as the Loenje, but his intention of crossing this river and going north on its eastern side *en route* for the Luena was frustrated by floods. He therefore intended to go straight to the Luena, follow it up some 200 miles, and return along the watershed of its northern tributaries. All the rivers between the Lui and Sejlefula rise, according to Captain Gibbons, much further east than has been supposed. All these explorations appear to have been made independently of the other members of Mr. Reid's party, but the routes of Captain Gibbons must have crossed theirs at several points. We hope before long to receive a full report of the work accomplished, which will be read with much interest.

Organisms of Marine type in Lake Tanganyika.—In a paper describing the anatomy of a jelly-fish from Lake Tanganyika, reprinted from the *Quarterly Journal of Microscopical Science* (vol. 36, part 2), Mr. R. T. Günther makes some general remarks on the occurrence of such marine forms in fresh water, and its possible explanation by a change in the physical geography of the regions in which they occur. The number of Medusae inhabiting fresh water is very limited, and the occurrence of one in Lake Tanganyika is made more striking by its association with several genera of molluscs of decidedly marine type. Where such forms are found not far from the sea, as is the case in a lagoon in Trinidad, their presence can be explained by supposing a former connection between the existing fresh water and the sea, and an excess of rainfall over evaporation subsequent to their separation. An analogous explanation in the case of Lake Tanganyika would involve the supposition that the marine forms wandered in at a time when the region of the lakes was more than 2700 feet lower than at present, and the Atlantic extended over the present Congo basin with a fiord-like arm occupying the site of Tanganyika. The freshness of the lake-water at the present day would imply that the condition of overflow which now obtains must, on the whole, have been the rule since the separation of the basin. It will be remembered that Mr. Joseph Thomson gave a somewhat similar explanation of the development of the Tanganyika basin, attributing its formation, however, to a date subsequent to the separation of the Congo sea from the ocean (cf. *Proc. R.G.S.*, 1882, p. 627).

M. Foureau's Journey in the Erg south of Algeria.—Owing to the disturbed state of the Tuareg countries, M. Foureau has this season confined himself, at the request of the Governor-General of Algeria, to an excursion in the

* The name appears, however, in Livingstone's first map (drawn by Arrowsmith) both as a tributary of the Zambesi (Loena) entering in about 15° S. lat., and also (Ruena) as a small lake further north-east.

Erg region south of the Shotts, between Tuggurt and Ghadames, about half of the distance traversed being over new ground. As usual, he has executed a survey and taken photographs of the country. He was unable to discover the site of an ancient watering-place in the south of the Erg, of which he had heard, but acquired a knowledge of some interesting facts relating to the features of the country. From north to south six different zones, distinct in general aspect and in vegetation, can be distinguished, to which special names are applied. The two last consist of very difficult country, and contain regular mountains, now almost ingulfed in sand. Indications of an eastern arm of the Igharghar, the existence of which M. Foureau had before hinted at, were discovered towards the south of the Erg, along a line marked by high barometric pressure (*Comptes Rendus*, Paris Geographical Society, 1896, nos. 5, 6, 7).

GENERAL.

Awards of the Paris Geographical Society.—The various medals and other awards of the Paris Geographical Society have this year been given as follows: Gold medals have been assigned to Prince Henry of Orleans (journey in Indo-China), Captain Toutée (Niger), Commandant Decœur (Niger), MM. Chantre (work in the Caucasus), F. J. Clozel (explorations north of the Sanga), Auguste Pavie (who also obtains a money premium, for his explorations in Indo-China), Dr. L. Lapicque (journeys in the Persian Gulf, etc., and studies on the Negritos), and Commandant Decazes (surveys, etc., in French Congo). A special medal and premium is given for the Dictionary of Geography begun by M. de St. Martin and completed by M. Rousselet. Silver medals fall to MM. Renaud and de l'Isle, for surveys in the archipelago of Pai-tsi-long (Tongking); to M. de Saint-Arroman, for his work on the Geographical Missions of the Ministry of Public Instruction; to M. Gochet, for works connected with the teaching of geography; to M. F. A. Forel, the limnologist: and to M. Foureau, the Saharan explorer. The Jomard prize is awarded to M. Froidevaux, for his works on the history of geography.

The Geographical Association.—The committee was engaged last year in collecting the opinions of masters of Secondary Schools, including all the great public schools, as to the desirability of certain reforms in examinations in geography. A report on the results of this inquiry has been printed and circulated, and a short summary of it was given in the *Journal* for February (p. 208). The next step was to draw up a paper of suggested reforms, which was submitted to the Royal Geographical Society, the Royal Colonial Institute, the Education Committee of the Teachers' Guild of Great Britain and Ireland, the Royal Scottish Geographical Society, the Manchester Geographical Society, the Reader in Geography at Oxford, and the Lecturer on Geography at Owen's College, Manchester. Having received their sanction and approval, the suggestions were recast in the form of a memorial, and this has now been sent, with a covering letter, to the following boards of public examiners, conducting examinations that specially concern the secondary schools; viz. the Civil Service Commissioners, the Delegates for Local Examinations of the Universities of Oxford, Cambridge, and Edinburgh, the Oxford and Cambridge Schools Examination Board, the London University (Matriculation), the Victoria University (Preliminary), the College of Preceptors, the Scottish Education Department, and the Scottish Universities Preliminary Examination Joint Board. Omitting the introductory letter, the reforms advocated by the committee of the Geographical Association are as follows: 1. That the main principles of physical geography should form the basis of geographical teaching at all stages, and should be fully recognised in all examinations in geography. 2. That a general knowledge of geography, based on physical principles, should be required, together with a special study of some selected

region, *e.g.* India, a group of British Colonies, South America, Central Europe. 3. That it is desirable that all public examining bodies, such as the Civil Service Commissioners, the Universities (in their Local and Certificate Examinations, and London Matriculation), and the College of Preceptors, should recommend a course of instruction in accordance with the ideas suggested above. This would stimulate geographical teaching in schools, ensure that geography should be systematically taught throughout the school, and do away with the need for separate classes to prepare candidates specially for the various public examinations in geography. 4. That in the examinations above referred to geography and history should be dealt with in separate papers, and that the maximum of marks should be approximately the same for each.

Geographical Methods.—In the January number of the *Geographische Zeitschrift*, Professor Ludwig Neumann of Freiburg-i-B. has a valuable survey of the German literature dealing with the question of Geographical Methods. He divides his paper into two parts—(1) the method of orienting the subject itself, (2) the method to be adopted in teaching it at different stages of education. The question, "What is Geography?" seems to be asked in Germany as well as in this country, and Dr. Neumann quotes the ideas of several authorities who agree in the main with each other and with our own geographers in their definition of the scope of the science. Geography has two aspects, general and special. General geography (*Allgemeine Erdkunde*) deals with the "general laws of the distribution of every single category of phenomena on the Earth's surface." Special geography (*Länderkunde*) "describes and explains the various countries in their characteristic and distinguishing peculiarities of land and water forms, climate, vegetable covering, animal life, human settlements and their conditions of organisation and culture." The main divisions of general geography are classified as (1) Mathematical Geography, (2) Geophysics, (3) Geographical Morphology, (4) Oceanography, (5) Climatology, (6) Biological Geography, (7) Historical, or better, Anthropogeography. 3, 4, 5, are grouped as Physical geography, but it would be better to include 1 and 2 also under this heading. In the second part of his paper Professor Neumann reviews recent German works on Geographical Pedagogics. Germany is fortunate in this matter, for many of the leading geographers have had experience in school teaching, and therefore write with authority. Dr. Neumann insists on the importance of the teaching of geography by experts, and ridicules the absurdity of entrusting it to a teacher who "has not had a book of geography in his hand for eight or ten years, and who has no suspicion of its scope, methods, or teaching material," as is still sometimes done in Germany, and almost invariably in our own country. Every teacher of geography will find this an indispensable guide to the German literature on the teaching of the subject, which is too voluminous for each to read for himself.

Local Maps in American Schools.—Professor W. M. Davis has written an interesting little paper entitled "The State Map of Connecticut as an aid to the study of Geography in Grammar and High Schools," which is published as "Connecticut School Document, No. 6." The author gives very clear instructions for using the new 1-inch to the mile contoured map of the state, and while touching on the importance of scholars being trained to draw rough route-maps, he lays much greater stress on the results to be expected from being able to handle and understand the good maps provided by government. "The systematic use of the State Topographical Map in schools," he says, "would greatly promote the chief end of all geographical study; namely, a clear perception of the fundamental facts of earth-form in their relation to the occupation of the earth by man. . . . The teacher and student of geography should turn a larger share of their attention from

mere matters of location to the more important and interesting questions of the reasons for location, as determined by various classes of geographical controls, such as the forms of land and water, the relative positions of different forms, the products of the earth, which in turn are determined by soils, climate, etc., and the available sources of power, such as coal, waterfalls, and wind, which in turn influence manufactures, trade, and commerce." What Professor Davis says applies with equal force to the utilization of the 1-inch map of the United Kingdom in the schools of this country, as a manual of home geography, and an incentive to wider study.

OBITUARY.

Admiral Sir Robert O'Brien FitzRoy, K.C.B.

By Admiral Sir Anthony H. Hoskins, G.C.B.

By the death of Vice-Admiral Sir Robert O'Brien FitzRoy, K.C.B., this Society has lost a valued member, and the navy one of its most prominent officers. The son of a father distinguished alike by his professional and scientific attainments, he evinced the same remarkable qualities which induced the latter, when Flag-Lieut. to the Admiral on the south-east coast of America, to take up the command of the *Beagle*, vacant by the death of Captain Stokes, and to carry out under circumstances of the most arduous nature those surveying duties which eventually led him to such high honour and distinction in the service of the country. The subject of this notice worthily followed in his father's footsteps, and from the first moment of his entry into the navy gave promise of the career in which he achieved such high distinction, and which is now prematurely cut short. Having served with much credit in the war with China, '57 and '58, and obtained his promotion, on his return to England he qualified for Gunnery-Lieut., and being appointed to the *Edgar*, attracted the notice of Sir Geoffrey Hornby, then captain of the ship, and who from thenceforward became his firm and constant friend. Following that distinguished officer into the *Bristol*, on the west coast of Africa, he became the commander of that ship at an unusually early age, and subsequently served in the *Prince Consort* in the Mediterranean.

Promoted to Captain in February, 1872, he was in August of that year selected, notwithstanding his youth, by Sir Geoffrey Hornby as his Flag-Captain in the *Minotaur*, the Flag-Ship of the Channel Squadron, and on the termination of that command he was after a short interval again selected by Sir Geoffrey to be his Flag-Captain in the *Alexandra* in the Mediterranean, where he shared all the difficulties and responsibilities which devolved upon his chief during the Russo-Turkish war. On the paying off of the *Alexandra*, it may be said that his reputation was established as one of the most reliable and able captains in the navy, and consequently when the Egyptian war broke out in the summer of 1882 he was at once appointed to the command of the *Orion*, a vessel which from her construction and light draught of water was sure to occupy an important position in any operations in which the navy could take part after the bombardment of Alexandria.

On his arrival out, being pushed up at once to Ismailia, the key of the situation in the canal, he seized that place when the time for action came, and subsequently commanded the Naval Brigade which was landed to assist in carrying the works of Tel-el-Kebir. For these services he was made a C.B., and by them added greatly to the already high estimation in which he was held. With such qualities and such experience, it was almost as a matter of course that on the reconstitution of the

Training Squadron in 1885 he was appointed to be the Commodore in command, and subsequently as Commodore of the first class and Rear-Admiral Superintendent of the Naval Reserves he shared in all the important naval manœuvres which have done so much to instruct the officers and men of the Fleet, and develop naval strategy and tactics during recent years. Scarcely had he struck his flag as Admiral Superintendent of the Naval Reserves, when he was again summoned to active service in command of the Channel Squadron, but to the infinite regret of the whole service it before long became apparent that his health was failing him, and actuated by that high sense of duty which was ever his most prominent characteristic, as soon as he realized that such was the case he applied to be relieved in his command, which he relinquished in May of last year. He has not long survived the termination of his professional career afloat, and in him those who were associated with him lose a valued and well-tried friend, and the navy a bright example of chivalrous devotion to duty and of all those qualities which a naval commander should possess. Admiral FitzRoy joined the Society in 1874.

William Edward Oates.

Mr. W. E. Oates, who died of typhoid fever at Madeira on Good Friday, April 3, at the age of fifty-four, was an African sportsman and traveller, whose name was likewise associated with that of his brother, the late Mr. Frank Oates, in his researches into the natural history of South Africa. In 1873-4 these two brothers made a prolonged expedition into the country northward of the Transvaal, Frank Oates proceeding further than his brother into some of the wildest districts of Matabeleland, and beyond these to the Zambesi. On his return homewards from the Victoria falls, Mr. Frank Oates died of fever in the Tati district, on February 5, 1875, the scientific and other results of this expedition being subsequently published in a volume entitled 'Matabele Land and the Victoria Falls.' After this Mr. W. E. Oates made several further expeditions in South and East Africa, either alone or accompanied by friends; and it is to be regretted that no record of these travels and researches has been published further than in the form of occasional contributions from his pen to the periodical literature of the day, the *Times* and *Field* included. On one of these occasions, when on his way to India, he made an expedition with Mr. Holmwood, then vice-consul at Zanzibar, into the region of the Wami river, where the rich tropical vegetation and abundant animal life which characterize the district afford the naturalist ample opportunities for research. At a later period, starting from Mozambique in company with the lamented Captain Elton, then consul at that place, he proceeded to the Lurio river, the Bay of Pemba and Lake Kagavero, and finally to Ibo. In these regions, rich in their natural produce and the variety of their scenery, Mr. Oates obtained many remarkable natural history specimens, and was again successful—as he had previously been upon the Wami river—in his pursuit of the hippopotamus. But from a sportsman's point of view, perhaps the most notable of his expeditions was that which he made, in the autumn of 1876, into the portion of Zululand then known as John Dunn's country, and watered by the river Umvolusi. Here the amount of large game found at that time was something memorable, vast herds of koodoo, waterbuck, blue wildebeest, and zebra being constantly come across; so that, in the space of a few weeks, Mr. Oates obtained to his own gun a large number of these and other animals, including the inyala, pallah, reedbuck, and many of the lesser antelopes. Here, too, Mr. Oates shot a fine specimen of the now fast disappearing white rhinoceros, and procured many ornithological specimens of unusual interest. A number of the birds collected by Mr. W. E. Oates and his brother

were presented to the British Museum, but some of them were retained in Mr. Oates's own possession, and formed, along with the magnificent trophies of the chase he had obtained during his travels, a private collection of almost unique interest. Besides the expeditions above alluded to and others in South Africa, Mr. Oates had made a sporting journey into India, had visited America, and had passed a summer yachting in the northern seas, the furthest point reached (owing to the ice) being Green harbour in Spitzbergen.

Of recent years Mr. Oates's journeys had been of a less extended character, but his interest in matters relating to South Africa never lost its hold upon his mind, and since the formation of the society recently set on foot with a view to obtaining a government grant of land in the interior for the protection and preservation of some of the rarer animals now threatened with extinction in that country, Mr. Oates had served on its committee, an active and useful member. At the time of his death he was projecting another voyage with his eldest son to South Africa in a few months' time, and it was the same love of these haunts of his earlier years that took him in their direction last winter as far as Madeira, where his remains now rest in the beautiful Protestant burial-ground of that island. Mr. Oates was an excellent amateur artist, and had a considerable literary gift, which his modest estimate of his own achievements chiefly prevented him from exercising more fully than he did. Himself a Yorkshireman by birth and descent, and for several years an officer in the 2nd West York Militia, he had married, in 1877, a daughter of the late Mr. Joshua Buckton, of West Lea, Meanwood, near Leeds, by whom he leaves a family of four children; but a few years ago he purchased the estate of Gestingthorpe hall, Essex, where he had since resided, interesting himself actively in all matters affecting the welfare of that neighbourhood. Mr. Oates had been a Fellow of this Society for upwards of twenty years.

Alvan Millson.

We regret to record the death of Mr. Alvan Millson, M.A., Assistant Colonial Secretary for the Gold Coast, who died at sea near Sierra Leone, of fever, on April 18. He was thirty-five years of age. He was formerly a district magistrate in British Honduras, and was appointed district commissioner in Lagos in 1887, becoming Assistant Colonial Secretary two years later. He acted as special commissioner to the Yoruba country during the early part of 1890. Afterwards he held successively the posts of acting district commissioner eastern district, Acting Colonial Secretary and Deputy Governor, and then became chief Assistant Colonial Secretary for the Gold Coast Colony. He had been a Fellow of the Society for several years. In 1891 Mr. Millson contributed to the Society a valuable paper on his journeys in the Yoruba country (*Proc. R.G.S.*, 1891, p. 577).

CORRESPONDENCE.

Ancient and Mediæval Makran.

I VENTURE to submit the following remarks by way of friendly criticism and comment on some of the points dealt with by Colonel Holdich in his interesting paper published in the April number of the *Geographical Journal*. Though Makran lies so close to India, and a good half of it within what may be called our outer political border, much of it remains still unexplored, and many problems connected with its

ancient topography have yet to be solved. We ought, therefore, to be thankful to Colonel Holdich for affording us some light on these matters.

Colonel Holdich agrees with those who derive the name Makran from the Persian *Mahi Khuran*, the equivalent of *Ichthyophagoi*, and it may be said that the suggested etymology has no other equally probable to compete with it. Hamza of Ispahan laid it down that the name came from *Mah* = "moon," and *Karan* = "coast," the moon being supposed to exercise a favourable influence on the fertility of a country (see Meynard's 'Dict. de la Perse,' p. 538). This reads like a bad joke made at the expense of a province to which nature has been so unkind. The old Arab writers always called the province *Mukran*, but their authority for so doing is perhaps questionable. They sometimes wrote *Kunduhar* for *Kunduhar*; they called those *Bulus* who call themselves *Baluch*; they turned *Jat* into *Zutt*, and ancient *Dewal* (in the Indus delta) into *Daybul*. In short, they had difficulties about foreign pronunciation, and also a terrible habit of copying previous writers without stopping to question about the right or the wrong.

It is a curious fact that the name Makran, which in the middle ages applied to all the vast tract between the sea and Sijistan, is now restricted to a comparatively narrow strip of country south of the plateau, bordered by the Kej valley and its prolongations east and west. North of this line the people appear to have a certain contempt for the name Makran, not probably because of its association with the old wretched "fish-eaters," of whom they have most likely never heard, nor yet because of the exceedingly "fishy" character of the coast population of the present day, but, rather owing to the fact that another name, viz. *Baluchistan*, has from various political accidents acquired a certain prestige and, so to say, pushed the older one to the wall. This strip of land along the coast was no doubt the country of the Ethiopians of Herodotus, of which people, says Colonel Holdich, no representative is now to be seen; yet that the "father of history" was right is the less difficult to believe now that the learned German, Dr. Glaser, seems fairly to have established his point that the original home of the *Habash* was in South-East Arabia, whence a body of them may very well have passed across the gulf of Oman to seek their fortunes in a land so similar in climate and physical conditions to that of their forefathers.

The ethnology of the province, indeed, offers many points of interest, and it is a subject which Colonel Holdich treats with predilection. The Ethiopians have vanished no one knows whither. In their old abodes we find another race, the *Med* (*Mayd* of the 'Ar. Geog.'), who in the middle ages were scattered along the Indus banks, and were very numerous in the arid tracts between that river and Guzerat. It is probable that descendants of these are to be found in the *Muhana* of modern Sindh, who are largely boatmen and fishermen, but it would seem that some cause or other led a great body of the tribe to migrate westward and settle on the Makran coast, where alone their name survives. Many of the race had always dwelt in the Indus delta, and devoted themselves to piracy. The Nagamara of Dewal, whose proceedings caused, or at all events furnished a pretext for, the Arab invasion of Sindh in 710 A.D., appear to have been a sub-tribe of the Med. Then there has been the spreading in Makran and the great eastward migrations of the Baluch tribes. These people, when we first hear of them in something more substantial than tradition, are found in various settlements between South-Eastern Karman and Panjgur in Eastern Makran. So far as is known to history, their earliest abodes appear to have been in the district south of Jiruft, in Karman, where they are described by El Mukaddasi as a nomad people living in hair-cloth tents, and as having for near neighbours another tribe who stood in awe of them. This was the people called *Kufs*, and also *Kuj* or *Koj*, who are often identified with the Baluch, but were actually

quite distinct from them, and claimed to be of Arab origin. They are said to have been the vilest set of savages. The Baluch themselves were evidently then the lawless and freebooting race we know them to be now when not controlled by a strong government, for we are told that 'Adudu'd-Daula, who was governor of Fars in the last quarter of the tenth century, harried them severely.*

Coming now to the ancient topography of Makran, Colonel Holdich is certainly right in identifying the *Kannasbur*, or perhaps *Fannazbur*, for which there seems to be better authority, with *Panjgur*. It is sometimes written *Fanajbur* and *Banajbur*, and as there is no *p* in Arabic, the latter name might represent an actual *Panajpur*. Then as regards the last syllable, the Baluch are given to turning the Persian *b* into *g*, and *gw*. Thus Persian *besh* becomes *gesh*, and *bazi* becomes *gwazi*. Another name which has undergone a similar change is the *Bih* of the Arab geographers, now known as *Geh*. The Punjgur of these writers was very ancient, and of Hindu foundation. The first mention of it, as Colonel Holdich shows, occurs in connection with an expedition made by the Brahman Prince of Sindh in the first half of the seventh century A.D., but Colonel Holdich makes a slight mistake when he says that the prince *built* the fort there; he only repaired what is described as an old and dilapidated fort, so that Panjgur may have been ancient even thirteen centuries ago. It is not unlikely that the Hindu name was *Panchapur* ("five towns or villages"), for the name might have applied then, as it has long done in later times, to a small group of settlements, one of which was larger than the rest and contained a fort. In 659 A.D. began the incursions of the Arabs into Makran and the present provinces of Jhalawan and Sarawan.† Their forces in this quarter seem to have been merely strong raiding-parties, and a main object with them was to establish themselves at some point as far east as possible whence they could issue to plunder Sindh. Such a point they found at *Kuzdar*, a name still extant, over 200 miles east of Panjgur. But they could hardly have gone so far eastward without first mastering Panjgur, and, at all events, this place must have been intended by Beladhuri when he wrote that Makran and its *capital* were conquered by an officer of the Khalifa Mu'awiya about 666 A.D., for centuries later Panjgur is described as the largest town in Makran, though Kej had then become the seat of government. It was certainly taken by Md. bin Kasim in 710 A.D., when on his way to the conquest of Sindh. It was, in fact, a place commercially and strategically important as a centre to which routes converged from Karman, perhaps Sistan, Kuzdar, Dewal in the Indus delta, and Tiz (now Tes), the great port of Makran. At that time the great East and West route through the province began at the ancient town of Fahraj (called by its inhabitants, says Y'aqubi, Fahra) in Narmashir, and passed through Panjgur to Kuzdar. It is curious that, of many places in Makran mentioned as lying on this route by Ibnu Khurdadhbeh—the only writer who refers to it—Panjgur is the only one now existing, or that can be identified with certainty. Colonel Holdich makes a little slip in saying that the Fahraj east of Bampur is in the "Karman district," for it is in the very centre of Makran; and his identification of the Fahraj, said to have been near Tubaran, with the Bampur Fahraj, is out of the question, as he would admit

* But it is fair to say that the Arab geographers describe the Baluch as harmless and inoffensive.

† That portion of Sarawan which lies between the Pishing and Quetta valleys on the north and Sohrab on the south was probably the *Kaykan*, *Kizkan*, etc., of Arab and later times. In a little work on the 'Indus Delta,' published two years ago, I made the mistake of putting Kaykan too far east, and bringing it into the present Kachhi country, whereas it lay immediately west of the latter. Jhalawan (excluding any portion of Makran) is the *Turan* of the Arab geographers.

himself on learning that the former was 130 farsakhs (at least 450, and perhaps over 500, miles), while Fahraj, east of Bampur, is only some 240 miles from Panjgur. It was the name of the first stage on this route from Fahraj, or Fahra, that led Idrisi into a lot of confusion. He read it *Tubaran*, and he confounded it with *Turan*, the name of the province immediately east of Makran, but the real name was *Tabaran*. The stage so called was 10 farsakhs (probably 40 miles) from Fahra, and it was "within the limits of Makran." It was, in fact, on or near the frontier, as we find from a subsequent remark of the author. Now, the description above given necessitates the location of Tabaran east or south-east of Fahra, and distant from it 40 miles, more or less. From his knowledge of the country, Colonel Holdich would at once see that in such a situation there never can have been a town "on the banks of a river which are cultivated and fertile," and Ibnu Khurdadhbeh says nothing about a river or cultivation. The place unconsciously referred to by Idrisi when he described Tubaran, was Kuzdar, for he followed Ibnu Haukal in the error of making a place called Turan (probably imaginary) his capital of the province of that name, while the other geographers say the capital was Kuzdar, and know nothing of a *town* called Turan. Thus Idrisi's description of his Tubaran was what he found recorded of the real capital Kuzdar. He flounders about indeed, in this part of his geography, in a ludicrous manner. Thus his *Fardan* is certainly due to a scribe's mis-writing of Kuzdar, both names looking very much alike in the Arabic character when points are omitted, as they frequently are. In the absence of these, it is quite impossible for any one unacquainted with the name intended to say whether *Q* or *F* is to be read, and in hurried writing *r* at the end of a word is often mistaken even by experts for *n*. Idrisi's *Kiz Kaiun*, represented as in Central Makran, is the Kaykan or Kizkan which I have described as being part of the modern Sarawan province; and *Sura* was not in Makran, but a little north of Kalat, where, it is said, its ruins may yet be seen. The place appears in Ibnu Haukal's map. It must be remembered that Idrisi himself never was within thousands of miles of these regions, and that in compiling his work he had to depend chiefly on the older geographers, some of whom had indeed enjoyed the advantage of visiting the countries they described, but were, nevertheless, too often careless and inconsistent, while all were wanting in the critical faculty, and ready to copy anything from a previous writer. El Mukaddasi is the one least open to blame in this respect.

To enter into the consideration of Ibnu Khurdadhbeh's route at any length would occupy too much space; I shall only, therefore, notice one or two of the stages mentioned. It appears to me that Tabaran might be placed at Gehgan of Pottinger's route, which is rather more than 40 miles from Fahra, and on the border of Makran. The second march was a very long one of 14 farsakhs (56 miles), indicating a journey over a desert and waterless tract. Such would be the case in the stage from Gehgan to Basman, which, however, is more than 60 miles. Whether Basman is the modern representative of the *Basurjan* of the ninth century, which is the name of the second station in the route, I should not care to speculate. It would seem to be the place meant by Idrisi when he speaks of *Masurjan*. Ibnu Khurdadhbeh calls it the chief town of *Kharun*, a district which I am unable to identify. At this point I leave the route, and turn to some of the other ancient places mentioned by Colonel Holdich.

He suggests that the town of the *Kharaj*, or "Schismatics," called Rask (he prefers *Rusak*, I know not which is correct), was not the present place of that name, but probably occupied the position of the modern Sarbaz. To this he has been led by the consideration that Rask is a mere hamlet, without any appearance of ever having been anything better, while the ancient

Rask, he thinks, was a place of considerable celebrity, as the old writers invariably couple with the mention of its name the statement that "it is the town of the schismatics." But I cannot myself see in this statement anything to justify the conclusion he comes to. It is not said that Rask was a place of more than ordinary size, or that its inhabitants were remarkable in any respect more than other sectaries, but merely that it was a settlement of schismatics, a fact which would naturally attract the attention of an orthodox Musulman. It attracted Istakhri's attention; he noted it in his work, and others copied his statement. Then, if we refer to the itineraries the weight of evidence is against Colonel Holdich's suggestion. But here it is necessary to examine his location of the *Fahalfahra* of the geographers. He says "there is good reason for believing" that the present Bahu Kalat is on the site of Fahalfahra, but, in the absence of any statement of the reason, I venture to think it possible to produce good reasons for a very different identification. I believe that Fahalfahra is to be found in the *Fahraj* east of Bampur. As Fahraj of Narmashir was called Fahra by its inhabitants, there is nothing improbable in the suggestion that Fahraj of Makran may have been called Fahra too. Now, in two of the codices collated by Professor de Goeje, in preparing his critical edition of the text of Ibnu Haukal, he found the reading *Tal Fahra* instead of Fahalfahra, and I venture to think this reading is the correct one. It has, at all events, the advantage of being significant, for *Tall Fahra* * would mean "Fahra on the Mound," or "Mound of Fahra," and, as we know, mounds in the East are often evidence of the great antiquity of a site, being, in fact, composed of the *débris* of perhaps many successive fortresses or cities which have long since perished. Colonel Holdich is certainly right in considering that Fahraj of Makran, which appears to be also called *Puhra*, is the representative of *Pura*, the capital of Gedrasia in Alexander's time; but it must be admitted that the absence of ruins (if St. John is correct) is against his identification, as well as mine, which belongs to much later times. Has the neighbourhood, however, been thoroughly explored? Now, if we turn to the itineraries of the older geographers, and follow them on the map, we shall find that they proceed in a regular and intelligently arranged circuit. Thus, taking Istakhri's route, which was followed by the rest, the starting-point is Tiz, thence north-east to Kiz, and here it is to be observed that, if Fahalfahra had been on the site of Bahu Kalat, it would have been mentioned before Kiz, as it would have been the first place reached. Then from Kiz north-east to Panjgur, thence west to Dizak, south-west to Rask, north (as I contend) to Fahalfahra, south-west to Isfaka, south to Band, south to Bih (Geh), east to Kasrkand. Here the traveller is once more in the great Kej valley, and he proceeds with the route from Kej towards Sindh. It will be noticed that if, on leaving Rask, he had turned *south* to Bahu Kalat, the stage following that could not possibly have been to Isfaka, which, as the crow flies, is 110 miles distant, while the itinerary calls it two *short* stages—a discrepancy which naturally puzzles Colonel Holdich. But let us see how the itinerary tells in the circuit involved in my identification of Fahalfahra. The geographers say, "From Rask to Fahalfarah three days." † The actual distance in miles, according to Sir F. Goldsmid's route, from Rask to Fahraj, is 119. As an *estimative* day's journey—39 miles, or a trifle more—is nothing extraordinary in Eastern itineraries, then, Fahalfarah to Isfaka is two *short* stages. Fahraj to Isfaka is 45 miles, and 22½ miles would constitute a short stage. Here, then, I think, is sufficient ground for placing Fahalfarah on or near the modern Fahraj, and Rask where the present village of that name is. Further support of these views may be

* The *tashdid* over the *l* in *Tal* does not appear in the manuscripts, as might be expected. The scribe would say, "Any fool knows that the *l* in *Tal* is *mushaddad*."

† Idrisi alone has two days

found in the Arab geographers' maps. If Fahalfarah had been where Bahu Kalat is, it would have appeared in those curious maps as almost touching Tiz towards the north-east, but there it does not appear, and if the map at p. 32 of Elliot's first volume be examined, it will be seen that Fahalfarah is not in it, and evidently because there was no room for it above Isfaka. In Istakhri's map it is shown, and very far north.

Another location of Colonel Holdich's requires correction. He identifies the *Band* of the geographers with the present *Binth*, but this village is at least 60 miles from Istaka, while the itinerary says the distance was one stage. He might point to the 119 miles between Kej and Panjgur, which the itinerary makes two stages, in justification of a 60-mile stage, but then the itinerary is clearly in error. The difference between 2 and 3 in the Arabic numerals is very slight, and 3, when rapidly written, may very easily be mistaken for 2.* The error here, then, is probably to be laid at the door of Istakhri's manuscript, which, as in too many other cases, has been servilely followed by the later geographers. *Band* is a word in common use in Makran for a ridge of hills. Such a ridge occurs at 20 miles or so south of Isfaka, *on the road to Geh*—the ancient *Bih*—and it is not unlikely that there was some halting-place in the pass over the hills named *Band*. From this place to Bih, or Geh, was another stage, the distance being 25 miles. The only objection that can be brought against my location of *Band* is the shortness of these two stages, while the itinerary does not say that they were short. It is, however, more natural to suppose a slight omission on the part of the geographer than to imagine his assigning only two stages to a distance of some 120 miles (Isfaka to Geh *viâ* Binth). Moreover, Binth lies far outside of the track, still existing, from Bampur to Tiz *viâ* Isfaka, which, if Colonel Holdich is right in believing that Tiz was once the port for the Sistan trade, was probably the route by which caravans passed from Fahraj of Narmashir to the coast of Makran.

Having occupied so much space with these criticisms, I must pass over other interesting questions of Makran topography dealt with by Colonel Holdich, to notice his identification of a place at the eastern end of the Makran-Sindh route. This is the town of *Khur*, which is mentioned by Idrisi, but by none of the earlier geographers. It is identified by Colonel Holdich with a place called *Khair*, on the Mahr hill-torrent, near Karachi. Idrisi says that the road from Dewal to Makran passed through a small but populous town named Khur, but gives no further hint by which its position might be determined. I myself, however, feel confident that we have the key to its identification in its name. *Khur* is an Arabic word meaning "estuary" and "creek;" its equivalent in Sindhi is *Gharo*, or *Ghara*. Now, there is a village called *Gharo*, which, of course, had its name from its position at the head of the Gharo, or Khur, some 40 miles long, which is probably the remnant of the ancient *Sindhu Sagar* branch of the Indus, and also the channel by which Nearchus sailed down to the sea. Supposing *Dewal* to have been in the position I assign to it, or in any other equally consistent with such evidence as exists, this place Gharo must have been on the road from it to Makran. Arabs would naturally call it Khur. If it was founded, as it well may have been, by Arab seafaring traders, it must have been known as Khur before Sindhis called it Gharo. Both Arabic and Sindhi were spoken in Sindh in mediæval times, as the geographers inform us, and a large proportion of the Sindhi vocabulary at the present day is Arabic. This, as it seems to me, obvious identification, I regret to say, occurred

* In the Arabic the word "stage" appears in the dual (*marhaltan*), so that the author certainly meant "two stages," but the rough notes, or diary, written on the journey would probably have the distances expressed in numerals, and so the suggested mistake might occur.

to me only after the publication of my book on the 'Indus Delta,' a circumstance the more unfortunate that the discovery of Idrisi's Khur is all in favour of the views put forward therein as to the site of Dewal. I may mention, however, that since that little work appeared, I have come upon further evidence which points to a position for the old port some miles farther east than that fixed upon by me, but which cannot be discussed on the present occasion.

Colonel Holdich's location of the mediæval *Manhabari* (said to be two stages from Dewal, on the Makran route) at Pir Manga (vulg. Muggur Peer) is founded on a mistake. It was the Manhabari, or Manjabari, *on the Indus* that was "surrounded with gardens, fountains," etc. Nothing is said of the surroundings of the place on the Makran route, and there are some reasons for thinking that that route ran far to the north of Pir Manga.

It may be noted that *Yusli*, *Kirusi*, *Labi*, and some other names found in Idrisi's work and in the geographers' maps, are corruptions; also that the *Kalmati*, sometimes called the *Karmati*, who are found in South-Eastern Makran and Lower Sindh, are Baluch originally from Kalmat, on the Makran coast, and are in no way connected with the famous sectaries known as *Karmati* (or *Karamita*) in the ninth and tenth centuries A.D. On the collapse of the sect individual members of it fled no doubt in all directions, and especially to Sindh, the great refuge of the rebellious and the heterodox. If those fugitives have left behind them memorials indicative of artistic taste, it can only be said that they must have been men differing widely in type and tendencies from the older Karamita.

M. R. Haig, Major-General.

Postscript.—Since the above was written and despatched, it has occurred to me that I have perhaps been too hasty in saying that Colonel Holdich is in error in placing the eastern Fahraj in Karman, while it is, in fact, in the middle of Makran. I referred to the Makran of mediæval times, then, as we know, far more extensive than the modern province. But it may be that the Persian Baluchistan of to-day, which has absorbed so large a portion of old Makran, and includes the eastern Fahraj as well as a wide extent of territory between it and Kalati Baluchistan, is administered as subordinate to the government of Karman, and Colonel Holdich may have written in that sense. The latest maps, however, that I have seen, so far as they indicate an eastern limit of Karman, place it far to the west of Fahraj. It is at the same time fair to say that, on a further examination and comparison of the Arab writers, it appears to me not improbable that in their day the eastern Fahraj was an outlying dependency of Karman. Confusion on the subject has been occasioned by the fact of there being two places of this name, a circumstance of which Ibnu Khurdadhbeh, for instance, was apparently not aware, he having been only a compiler, and under the necessity of trusting to the reports of others. I cannot, however, ask for further space to deal with this question, which must be left to some other opportunity.

M. R. H.

The Anglo-Afghan Frontier Agreement.

In an article in the current number of the *Geographical Journal* (p. 547) exception is taken to a statement made recently by Lord George Hamilton in regard to the Bashgul and Arnawai valleys draining into the Kunar river. The statement in question arose out of a controversy about the Durand Agreement and the boundaries of Kafiristan. The *Geographical Journal* says, "It will be apparent . . . that Lord G. Hamilton's statement is not clear; in fact, it seems based on inaccurate topography. . . . Mr. McNair and Colonel Woodthorpe's information shows clearly that the Arnawai valley lies west, and not east, of the

Kunar river." It now appears that Lord G. Hamilton's statement was correct. In old maps the alternative name "Arnawai" is wrongly given to the Bashgul valley. It is a separate valley which lies east, not west, of the Kunar river.* The true facts of the case were made known by Sir George Robertson. He says, "The gallant McNair . . . never entered the real Kafir country at all; he only succeeded in reaching some of the Kalash villages of Chitral, which he mistook for the true Kafiristan" (*Geographical Journal*, Sept. 1894, p. 194).

STEPHEN WHEELER.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1895-1896.

Eleventh Ordinary Meeting, April 27, 1896.—CLEMENTS R. MARKHAM, ESQ., C.B., F.R.S., President, in the Chair.

I may mention that it is the intention of the Royal Society of Canada to have a celebration of the fourth centenary of the discovery of North America by John Cabot, and, in writing to wish them all success in this laudable intention, I ventured to say—and I hope I was right—that my feeling would be shared by all the Fellows of this Society, with regard to the efforts of their fellow-subjects in Canada. We might have a celebration of John Cabot's discovery somewhat earlier in the year, say the time of his sailing from Bristol, in the early part of May, 1497; and we will not forget, next year, that splendid old navigator, Vasco da Gama, who sailed on March 25, 1497.

ELECTIONS.—*Charles Mylne Barker; Alexander Duncan Gordon; William Leathern; James Macredy, M.A.; Giovanni Pelleschi; Charles Salmon.*

The Papers read were:—

1. "Journeys in the Native Malay States." By Hugh Clifford, Esq.
2. "A Journey round Siam." By J. S. Black, Esq.

Twelfth Ordinary Meeting, May 11, 1896.—CLEMENTS R. MARKHAM, ESQ., C.B., F.R.S., President, in the Chair.

ELECTIONS.—*George Thomas Baron; Robertson Fuller Bertram; Herman Bicknell; Major G. Cunningham; John Gordon Douglas; Captain Eustace Guinness, R.A.; Michel G. Holban; Captain Richard Abercrombie Irvine (Donegal Artillery); George Henry Judd; Captain S. L. Norris, R.E.; Commander Herbert Edward Purey-Cust, R.N.; Thomas Thynne, J.P.*

The Papers read were:—

1. "Through the Central Sudan to Sokoto." By William Wallace, Esq.
2. "Hausaland." By Rev. Chas. H. Robinson.

Thirteenth Ordinary Meeting, May 18, 1896.—CLEMENTS R. MARKHAM, ESQ., C.B., F.R.S., President, in the Chair.

ELECTIONS.—*George Rourke Bryant; Lieut. E. H. Cator, R.E.; The Earl of Crewe; G. Beresford FitzGerald; Charles Paul Mackie; Captain E. J. Medley (17th Bengal Cavalry); Sir Montagu Frederick Ommanney, K.C.M.G.; Lieut. Gerald Christopher* (1st *Batt. Wilts Regiment*); *Henry B. Simonson; Charles Lindsay Temple.*

The Paper read was:

"Journey from Talifu to Assam." By H.R.H. Prince Henry of Orleans.

* 'Parliamentary Papers.' East India (north-west frontier, Bashgul valley), 1896.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., *Librarian*, R.G.S.

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce, Commercial.
C. R. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
J. = Journal.
M. = Mitteilungen.
Mag. = Magazine.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue, Revista.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

EUROPE.

Germany—Palatinate. *G.Z.* **2** (1896): 82–90. **Geistbeck.**

Die bayerische Pfalz. Ein geographisches Charakterbild. Von Dr. Alois Geistbeck.

Germany—Prussia. *Aus allen Weltteilen* **27** (1896): 196–202, 237–244. **Tetsner.**

Quer durch Preussisch-Litauen. Von Dr. F. Tetsner.

Germany—Riesengebirge. *Z. Ges. Erdk. Berlin* **31** (1896): 64–72. **Galle.**

Höhenbestimmungen mit Siedethermometern im Riesengebirge. Von Dr. A. Galle.

Germany—Silesia—Earthquakes. **Leonhard and Volz.**
Z. Ges. Erdk. Berlin **31** (1896): 1–21.

Das mittelschlesische Erdbeben vom 11 Juni 1895, und die Schlesischen Erdbeben. Von Dr. Richard Leonhard und Dr. Wilhelm Volz in Breslau. *With Map.*

Germany—Thuringia. *M.G. Ges. (für Thüringen) Jena* **14** (1895): 57–67. **Gerbing.**

Beiträge zur Ausrottung der Raubtiere im Thüringerwald (gothaischen Anteils). Von L. Gerbing.

Selections from documents on the destruction of beasts of prey in Thuringia.

Greece—Macronisi. *B.S.R. Belge G.* **20** (1896): 57–63. **Hauttecoeur.**

Le rocher de la Belle Hélène. Par Henry Hauttecoeur.

Iceland. *B.S.R. Belge G.* **20** (1896): 64–87. **Foulon.**

L'Islande. Par Maurice Foulon.

Account of a visit to Iceland in 1894

Norway—Meteorology. **Mohn.**

Jahrbuch des Norwegischen Meteorologischen Instituts für 1892. Herausgegeben von Dr. H. Mohn. Christiania, 1894. Size 13½ × 10, pp. xiv. and 108.

Russia—Finland—Meteorology. ———

Observations publiées par l'Institut Météorologique Central de la Société des Sciences de Finlande. Volume Treizième: Helsingfors, 1895. Size 14 × 10, pp. viii. and 112.

Russia—Geology. **Nikitin.**

Bibliothêque Géologique de la Russie, 1894. Composée sous la redaction de S. Nikitin. Supplément au T XIV. des Bulletins du Comité Géologique. St. Petersburg: Eggers & Co., 1895. Size 10 × 7, pp. viii. and 202. *Presented by the Geographical Committee of the Imp. Russian Geographical Society.*

Russia—Southern Lagoons. **Sokolow.**

Ueber die Entstehung der Limane Südrusslands. Von N. Sokolow. Mémoires du Comité Géologique, vol. x., No. 4. St. Petersburg: Eggers & Co., 1895. Size 13½ × 10, pp. vi. and 102. *Map.*

Russia—Wind. *B.A. Imp. Sci. St. Pétersbourg* (5) 3 (1895): 59–67. **Kiersnowsky.**

La distribution du vent sur la surface de l'Empire Russe. Par J. Kiersnowsky.

Spain—Flora. *B.S.G. Madrid* 37 (1895): 337–386. **Lazaro e Ibiza.**

Regiones botánicas de la peninsula ibérica. Por D. Blas Lázaro é Ibiza. *With Map.*

Spain—Pyrenees—Railways. *B.S.G. Madrid* 37 (1895): 387–410. **Jiménez y Lluesma.**

Los ferro-carriles del Pirineo y la defensa nacional. Conferencia dada en la Sociedad Geográfica de Madrid el 6 de Noviembre de 1894. Por D. Eusebio Jiménez y Lluesma.

On the strategic importance of the railways of the Pyrenees.

United Kingdom—English History. **Temple.**

England's History as Pictured by Famous Painters. By A. G. Temple. Part I. London: G. Newnes [1896]. Size 11 × 14, pp. 20. *Illustrations. Price* 6*d. Presented by the Publisher.*

United Kingdom—Scotland—Climate. **Mossman.**

J. Scottish Meteorological S. (3) 10 (1896): 163–173.

The Frost of 1895 in Scotland. By R. C. Mossman. *With Maps.*

ASIA.

Baluchistan—Makran. **Holdich.**

Notes on Ancient and Mediæval Makran. By Colonel T. H. Holdich, C.B., etc. From the *Geographical Journal* for April, 1896. Size 10 × 6½, pp. 20. *Map.*

Central Asia. *Petermanns M.* 42 (1896): 33–41, 62–69. **Krahmer.**

Die Expedition der Kaiserl. Russischen Geographischen Gesellschaft in Mittelasien. Von Generalmajor z. D. Krahmer.

Central Asia—Climate. *Meteorologische Z.* 13 (1896): 49–61, 90–100. **Woeikof.**

Das Klima Centralasiens nach den Beobachtungen von Prschewalsky. Von A. Woeikof.

India—Assam. ———

Report on the Administration of the Province of Assam for the year 1894–95. Shillong, 1895. Size 13 × 8½, pp. xiv., 230 and clxxxii. *Map.*

India—Bombay Observations. ———

Magnetical and Meteorological Observations made at the Government Observatory, Bombay, in the year 1894, under the direction of Charles Chambers and Frederick Chambers. Bombay, 1895. Size 13½ × 10, pp. xvi., 16, and 12. *Presented by the Right Hon. the Governor in Council at Bombay.*

India—Burma. *Oesterr. Monats. f. d. Orient* 22 (1896): 23–26. ———

Der Aussatz in Birma.

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The great landslip at Gohna, in Garhwal, and the measures adopted to prevent serious loss of life. By J. H. Glass. *With Plan, Section, and Illustration.*

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Report on the Administration of the N.-W. Provinces and Oudh for the year ending 31st March, 1895. Allahabad, 1896. Size 13½ × 8½, pp. iv, xxxiv., 224, iv., and 192.

India—Punjab—Sialkot District. **Smith.**

Gazetteer of the Sialkot District. By Captain J. R. Dunlop Smith. 1894–95. Revised Edition. Compiled and Published under the Authority of the Punjab Government. Lahore, 1895. Size 10 × 7, pp. ii., ix., 196, and lii. *Map.*

India—Wrecks and Casualties. **Street.**

Return of Wrecks and Casualties in Indian Waters for the year 1894. Prepared by H. A. Street, Commander R.I.M. Calcutta, 1895. Size 13½ × 8½, pp. 68. *Chart and Diagram.*

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The Industrial and Commercial Development of Japan. By James Troup, H.B.M. Consul at Yokohama.

Malay Archipelago—Celebes. *Z. Ges. Erdk. Berlin* **31** (1896): 21–49. **Sarasin.**

Reiseberichte aus Celebes. Von Paul und Fritz Sarasin. Vierter Bericht. *With Map.*

Palestine. **Clermont-Ganneau.**

Archæological Researches in Palestine during the years 1873–1874. By Charles Clermont-Ganneau, LL.D. Vol. ii. With numerous Illustrations from Drawings made on the spot by A. Lecomte du Moüy, Architect. Translated by John Macfarlane. Published for the Committee of the Palestine Exploration Fund, 1896. Size 11½ × 9, pp. x. and 504.

The second volume of this work is published before the first, which will be confined to the archæology of Jerusalem and its environs, while the volume now before us deals with the rest of Palestine.

Siam—Bangkok. **Ehlers.**

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Syria—Historical Sites. *Mém. A.R. Sci. et Lettres Danemark* (6) **4** (1895): 59–92. **Østrup.**

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Syria—Lebanon. **West.**

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Barometrical Determination of Heights in Lebanon. By Professor R. H. West.

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Colonel C. Airaghi: Le Dembélas. *With Map and Plate.*

African Folklore. **Seidel.**

Geschichten und Lieder der Afrikaner. Ausgewählt und verdeutscht von A. Seidel. Berlin: Schall & Grund [1896]. Size 7½ × 5½, pp. xii. and 340. *Presented by the Publishers.*

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The Problem of the Races in Africa. By Lieut.-Colonel H. Elsdale.

Algeria and Tunis—The Shotts. *Scottish G. Mag.* **12** (1896) 195–198. ———

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L'Angola et la colonisation portugaise. Par Ch. Delannoy.

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Commercial Prospects of British Central and East Africa. By G. F. Scott-Elliot.

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Oberflächengestalt und Klima von Usukuma. Von C. Waldemar Werther. *With Illustrations.*

Madagascar. *Rev. Scientifique* (4) **5** (1896): 457–466. **Delisle.**
La colonisation à Madagascar. Par Dr. Fernand Delisle.

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Reisen norwegischer Missionare in Madagaskar. Von G. Kurze. I. Missionar Th. Selmers Reise durch das nördliche Tanalagebiet. II. Missionar P. Nilsen-Lunds Reise durch das mittlere Sakalavaland.

Somaliland—Bòttego's Expedition. *B.S.G. Italiana* (3) **9** (1896): 97. ———
Notizie della spedizione Bòttego.

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Die zoogeographische Stellung der Insel St. Helena. Von Dr. W. Kobelt.

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The Development of Tropical Africa. By Sir George Baden-Powell, K.C.M.G., etc.

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International American Conference. Reports and Recommendations, together with the Messages of the President and the Letters of the Secretary of State transmitting the same to Congress. Washington: Government Printing Office, 1890. Size 9½ × 6, pp. 216, 68, 14, 18, 2, 10, 4, 4, 30, 8, and 8. *Maps.*

Canada—St. Lawrence Valley. *American J. Sci.* (4) **1** (1896): 302–308. **Chalmers.**
Pleistocene Marine Shore-lines on the South Side of the St. Lawrence Valley. By Robert Chalmers, of the Geological Survey of Canada.

Canada—British Columbia. **Dawson.**
Part B. Annual Report, Vol. vii. Geological Survey of Canada, G. M. Dawson, Director. Report on the area of the Kamloops Map-Sheet, British Columbia. By George M. Dawson. Ottawa, 1896. Size 10 × 7, pp. 428. *Illustrations. Presented by Dr. G. M. Dawson.*

The Report deals first with the physical geography of the region under discussion, and then with the general geology, and in detail with the various geological formations, the boulder-clay and minerals of economic value.

Canada—Geological Survey Department. ———
Summary Report of the Geological Survey Department for the year 1895. Ottawa, 1896. Size 10 × 6½, pp. 154. *Price 10 cents.*

Canada—Tides. **Dawson.**
Survey of Tides and Currents in Canadian Waters. Report of Progress by W. Bell Dawson. Ottawa, 1896. Size 10 × 7, pp. 22.

Mexico—Lower California. *P. California A. Sci.* (2) **5** (1895): 733–775. **Eisen.**
Explorations in the Cape Region of Baja California in 1894, with references to former expeditions of the California Academy of Sciences. By Gustav Eisen.

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The United States of America, 1765–1865. By Edward Channing, PH.D. Cambridge: the University Press, 1896. Size 8 × 5¼, pp. viii. and 352. *Maps. Price 6s. Presented by the Cambridge University Press.*

This careful and interesting historical sketch is divided into ten chapters, respectively entitled, The Colonies, 1760–1765; Constitutional Opposition, 1760–1774; Revolution; the Constitution; the New Nation; Supremacy of the Jeffersonian Republicans, 1801–1809; the Second War of Independence and the Era of Good Feeling; Democracy; the Extension of Slavery, 1849–1861; the War for the Union, 1861–1865. There are five short appendices and three historical maps.

United States. **Riley.**
Johns Hopkins University Studies in Historical and Political Science. Fourteenth Series. III. Colonial Origins of New England Senates. By F. L. Riley. Baltimore, 1896. Size 10 × 6½, pp. 76.

United States—California—Fauna and Flora. **Behr.**
P. California A. Sci. (2) **5** (1895): 368–376.
Changes in Fauna and Flora of California. On the Power of Adaptation in Insects. By H. H. Behr.

United States—Lakes Erie and Ontario, etc.

No. 108—Part IV. Hydrographic Office. Sailing Directions for Lake Erie and Lake Ontario. St. Clair and Detroit Rivers, and Lake St. Clair. Washington: Government Printing Office, 1896. Size 9½ × 6, pp. vi. and 154. *Charts and Illustrations. Presented by the U.S. Hydrographic Office.*

United States—Public Lands. **Newell.**

Department of the Interior—U.S. Geological Survey, Charles D. Walcott, Director. The Public Lands and their Water Supply. By Frederick Haynes Newell. Extract from the Sixteenth Annual Report of the Survey, 1894–95. Part II.—Papers of an Economic character. Washington: Government Printing Office, 1895. Size 12 × 8, pp. [70]. *Maps and Illustrations. Presented by the Author.*

United States—Yellowstone National Park. **Chittenden.**

The Yellowstone National Park, Historical and Descriptive. Illustrated with Maps, Views and Portraits. By Hiram Martin Chittenden. Cincinnati: The Robert Clarke Co., 1895. Size 8 × 5½, pp. xvi. and 398. *Presented by the Publishers.*

The region of the Yellowstone Park, famous for its natural wonders, is here comprehensively described under the three heads, Historical, Descriptive, and the Future, followed by a series of appendices, one of which deals with the geographical names of the district. There are numerous illustrations and several rough sketch-maps.

CENTRAL AND SOUTH AMERICA.

American Republics.

Special Exposition Bulletin. How the Latin American Markets may be reached by the Manufacturers of the United States. Bulletin No. 63. Bureau of the American Republics, Washington, U.S.A. Size 8½ × 6, pp. x. and 506.

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Manual de las Repúblicas Americanas. Oficina de las Repúblicas Americanas, Washington, 1891. Size 9 × 6, pp. 510. *Maps and Illustrations.*

Hand Book of the American Republics, 1893. Bureau of the American Republics, Washington City, U.S.A. Bulletin No. 50. January, 1893. Size 8½ × 6, pp. 604. *Maps and Illustrations.*

Bulletins of the Bureau of the American Republics. In six volumes. Vol. i. In Two Parts. Part i. Annual Report No. 1: Handbook No. 3; Breadstuffs (pp. 50, 604, and 92, maps and illustrations): Part ii. Mines and Mining Laws; Land and Immigration Laws; Commercial Information (pp. 348, 200, and 286). Vol. v. Tariffs. In Three Parts. Part i. Argentine Republic, Bolivia, Brazil, British Possessions (pp. xx., 202, 256, 140, and 54); Part iii. Peru, Salvador, Santo Domingo, United States, Uruguay, Venezuela (pp. 232, 40, 88, 62, 248, and 56). Vol. vi. Commercial Directories of the American Republics (pp. 456). Washington: Government Printing Office, 1893. Size 9 × 6.

Foreign Commerce of the American Republics and Colonies. Corrected to May 1, 1891. Bureau of the American Republics, Washington, U.S.A. Bulletin No. 6, May, 1891. Size 8½ × 6½, pp. 172. *Presented by the Bureau of American Republics.*

Argentine-Chilian Boundary. *Aus Allen Welttheilen* **27** (1896): 210–219. **Rohde.**

Ein Beitrag zum argentinisch-chilenischen Grenzstreit. Von Oberst Jorge J. Rohde. *With Map.*

Argentine Republic.

Bureau of the American Republics, Washington, U.S.A. Argentine Republic. Bulletin No 67. 1892. [Revised to February 1, 1894.] Size 8½ × 6, pp. 456. *Map and Illustrations.*

Bolivia.

Bureau of the American Republics, Washington, U.S.A. Bolivia. Bulletin No. 55. 1892. [Revised to July 1, 1893.] Size 8½ × 6, pp. 414. *Map and Illustrations. Presented by the Bureau of American Republics.*

An account of the present condition of Bolivia.

Chile and Patagonia. *Z. Ges. Erdk. Berlin* **31** (1896): 50–63. **Philippi.**

Bemerkungen über die orographische und geologische Verschiedenheit zwischen Patagonien und Chile. Von Dr. R. A. Philippi. *With Plate.*

The physical differences between Chile and Patagonia are of practical importance with regard to the present dispute as to whether the watershed or the line of highest

summits of the Cordillera is to be taken as the boundary between Chile and the Argentine Republic.

Colombia.

Bureau of the American Republics, Washington, D.C., U.S.A. Columbia. Bulletin No. 33. January, 1892. Size 8½ × 6, pp. 138. *Map and Illustrations.*

Costa Rica. **Calvo.**

Bureau of the American Republics, Washington, U.S.A. The Republic of Costa Rica. Some facts and figures, compiled and arranged by J. B. Calvo, 1893. Second edition. Followed by an article entitled 'Costa Rica at the World's Columbian Exposition at Chicago.' Special Bulletin, April, 1894. Washington, D.C. Size 9 × 6, pp. 56. *Map and Illustrations.*

Ecuador.

Bureau of the American Republics, Washington, U.S.A. Ecuador. Bulletin No. 64, 1892. [Revised to April 1, 1894.] Size 8½ × 6, pp. 178. *Map and Illustrations.*

Guatemala.

Bureau of the American Republics, Washington, D.C., U.S.A. Guatemala. Bulletin No. 32. January, 1892. Size 8½ × 6, pp. 192. *Map and Illustrations. Presented by the Bureau of American Republics.*

An account of Guatemala, largely dependent on official statements.

Haiti.

Bureau of the American Republics, Washington, U.S.A. Haiti. Bulletin No. 62. 1892. [Revised to September 1, 1893.] Size 8½ × 6, pp. 240. *Map and Illustrations.*

Honduras.

Bureau of the American Republics, Washington, U.S.A. Honduras. Bulletin No. 57, 1892. [Revised to March 1, 1894.] Size 8½ × 6, pp. 186. *Map and Illustrations. Presented by the Bureau of American Republics.*

This description of Honduras, which may be taken as a type of the monographs issued by the Bureau of American Republics, commences with a few pages of historical and geographical matter, and goes on to discuss political divisions, government, education, natural resources and finance, concluding with appendices concerning land and mining laws, tariff, and a commercial directory.

Jamaica.

Journal of the Institute of Jamaica. Volume i. (November, 1891—December, 1893.) Kingston, Jamaica, 1894. Size 10 × 7, pp. vi. and 392. *Portraits and Illustrations. Presented by the Institute of Jamaica.*

The publication of the Institute of Jamaica abounds in articles and notes descriptive of the island, and of the historical and scientific aspects of the West Indies in general.

Menendez' Travels in South America **Fonck.**

Viajes de Fray Francisco Menendez a la cordillera publicados a comentados, por Francisco Fonck. Valparaiso: C. F. Niemeyer, 1896. Size 10 × 7, pp. xxviii. and 112. *Map. Presented by the Editor.*

A centennial edition of the description by the missionary Menendez of his travels in the Cordillera of Chile and the Argentine Republic.

Nicaragua.

Bureau of the American Republics, Washington, U.S.A. Nicaragua. Bulletin No. 51, 1892. [Revised to August 1, 1893.] Size 8½ × 6, pp. 184. *Map and Illustrations.*

Paraguay.

Bureau of the American Republics, Washington, U.S.A. Paraguay. Bulletin No. 54, 1892. [Revised to October 15, 1894.] Size 8½ × 6, pp. vi. and 146. *Map and Illustrations. Presented by the Bureau of American Republics.*

An account of the geographical, political, and economic conditions of Paraguay.

Salvador.

Bureau of the American Republics, Washington, U.S.A. Salvador. Bulletin No. 58, 1892. [Revised to March 1, 1894.] Size 8½ × 6, pp. 170. *Map and Illustrations.*

Santo Domingo. **West Indies.**

Bureau of the American Republics, Washington, U.S.A. Santo Domingo. Bulletin No. 52, 1892. [Revised to March 1, 1894.] Size 8½ × 6, pp. 202. *Map and Illustrations.*

Southern Andes. **Lista.**

Viaje á los Andes Australes. Por Ramón Lista. Articulo publicado en los "Anales de la Sociedad Cientifica Argentina." Tomo xli., páginas 5 y siguientes. Buenos Aires, 1895. Size 10 × 6½, pp. 88. *Maps and Illustrations. Presented by the Author.*

Uruguay. ——

Bureau of the American Republics, Washington, D.C., U.S.A. Uruguay. Bulletin No. 61. 1892. [Revised to September 1, 1893.] Size 8½ × 6, pp. 348. *Map and Illustrations.*

Venezuela. *Scottish G. Mag.* **12** (1896): 184–195. ——

Venezuela. Short Sketch of its History, Geography, and Industries.

AUSTRALASIA AND PACIFIC ISLANDS.

Australia. **Gregory.**

The Geographical History of the Australian Continent during its successive phases of Geological Development. Inaugural Address [before the Australasian Association for the Advancement of Science] by the Hon. A. C. Gregory, C.M.G., President, Brisbane, Saturday, January 12, 1895. Size 9 × 5½, pp. 12. *Presented by the Author.*

Australian Handbook. **Gordon & Gotch.**

The Australian Handbook (incorporating New Zealand, Fiji, and New Guinea), Shippers' and Importers' Directory and Business Guide for 1896. London: Gordon & Gotch. Size 10 × 6½, pp. 632. *Maps, Plans, and Plates.*

Fiji Islands. *Ymer* **16** (1896): 27–46. **Stenberg.**

Bidrag till Kännedomen om Fidjiboarnes urgamla religion och forntida Kannibalism. Af Ernst G. Stenberg.

New Zealand. ——

New Zealand. Papers and Reports relating to Minerals and Mining. Wellington, 1895. Size 13½ × 8½, pp. 286, 64, 28, 16, 2, 4, and 28. *Maps, Plates, etc.*

Contains valuable reports on gold and coal mines, and on the geology of certain districts in New Zealand, illustrated by large-scale maps and the reproductions of very instructive photographs.

South Australia—Meteorology. **Todd.**

Meteorological Observations made at the Adelaide Observatory and other places in South Australia and the Northern Territory during the years 1891, 1892, 1893, under the direction of Sir Charles Todd. Adelaide, 1894–96. Size 13½ × 8½, pp. (1891) xiv., xviii., 42, and 122; (1892) xiv., xviii., 42, and 124; (1893) xiv., xx., 42, and 128. *Maps. Presented by Sir Charles Todd, Government Astronomer.*

Western Australia—Coolgardie Gold Fields. **Chewings.**

J.R. Colonial I. **27** (1896): 372–388.

Geological Notes on the Coolgardie Gold Fields. By Dr. Charles Chewings.

POLAR REGIONS.

Antarctic. *B.S.R. Belge G.* **20** (1896): 5–28. **Du Fief.**

La zone polaire australe et le projet d'une expédition antarctique belge. Par J. Du Fief. *With Map.*

This article gives some account of the projected Belgian Antarctic expedition.

Greenland—Scoresby Sound. **Ryder.**

Observations Météorologiques, Magnétiques et Hydrométriques de l'Ile de Danemark dans le Scoresby Sound, 1891–92, faites par l'Expédition Danoise sous la direction de M. C. Ryder. Publiées par l'Institut Météorologique de Danemark. Copenhagen: G.-E.-C. Gad, 1895. Size 14 × 9, pp. 6, 22, xlvi., 18, 6, xx., and 4. *Maps and Tables. Presented by the Danish Meteorological Institute.*

MATHEMATICAL GEOGRAPHY.

Geodesy. **Weiss and Schram.**

Publicationen für die Internationale Erdmessung. Astronomische Arbeiten des K. K. Gradmessungs-Bureau, ausgeführt unter der Leitung des Hofrathes Theodor

v. Oppolzer. Nach dessen Tode herausgegeben von Prof. Dr. Edmund Weiss und Dr. Robert Schram. VII. Band. Längenbestimmungen. Vienna: F. Tempsky, 1895. Size $12\frac{1}{2} \times 10$, pp. 190.

This part gives the difference in longitude between Cracow and Lemberg as $16^m\ 20{\cdot}959^s \pm 0{\cdot}021^s$; that between Czernowitz and Vienna as $38^m\ 20{\cdot}239^s \pm 0{\cdot}012^s$, and that between Lemberg and Vienna as $30^m\ 49{\cdot}829^s \pm 0{\cdot}026^s$.

Map-reading. *Rev. Scientifique* (4 S.) **5** (1896): 385–394. **Lapparent.**

Association française pour l'avancement des sciences. L'art de lire des cartes géographiques. Par M. A. de Lapparent.

Rotation of Earth. *P.R.S.* **59** (1896): 185–189. **Hough.**

The Rotation of an Elastic Spheroid. By S. S. Hough. (Abstract.)

Discusses the periodic displacement of the pole of the Earth on the hypothesis of its elastic distortion. If the Earth were mathematically rigid the period would be 305 days, if only of the rigidity of steel 440 days, while actual observation gives a period of 427 days, confirming the latter estimate.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Geology. *Tijds. K. Ned Aardrijks Genoots. Amsterdam* (2) **13** (1896): 1–24. **Cappelle.**

Bijdrage tot de Kennis van het Gemengde Diluvium. Door Dr. H. van Cappelle. *With Maps and Plate.*

Loess. *G.Z.* **2** (1896): 109–111. **Du Pasquier and Penck.**

Bemerkungen über das Alter und die Verbreitung des Lösses. Von Léon Du Pasquier und Albrecht Penck.

Meteorology. ———

Jahrbücher der K. K. Central-Anstalt für Meteorologie und Erdmagnetismus. Jahrgang 1893. Neue Folge XXX Band. Wien, 1896. Size $12\frac{1}{2} \times 9\frac{1}{2}$, pp. xx, 116, 182, 44, and 16.

Meteorology—Rainfall and Forests. *Science N.S.* **3** (1896): 546–552. **Fulton.**

How Nature regulates the Rains. By R. L. Fulton.

Oceanography. **Buchan.**

Specific Gravities and Oceanic Circulation. By Alexander Buchan. *With Nine Maps.* From the *Trans. R. S. Edinburgh* **38** (1896): 317–342. *Presented by the Author.*

Dr. Buchan here re-states the data published in his Report in the Summary of Results of the Challenger expedition, taking account of the density of ocean water *in situ*, and thence deducing the circulation of water throughout the mass of the ocean.

Oceanography—Bay of Biscay. *Rev. Maritime et Colon.* **128** (1896): 448–460. **Kergrohen.**

Mission Scientifique du "Caudan" dans le golfe de Gascogne. Par M. de Kergrohen. *With Map, etc.*

Physical Geography. **Timmerman.**

Tijds. K. Ned. Aardrijks. Genoots. Amsterdam (2) **13** (1896): 25–58.

Het tegenwoordige standpunt der Physische Geographie. Door J. E. C. A. Timmerman.

Plant-Geography. *G.Z.* **2** (1896): 90–94. **Schimper.**

Die gegenwärtigen Aufgaben der Pflanzengeographie. Von A. F. W. Schimper.

ANTHROPO-GEOGRAPHY AND HISTORY.

Commercial Geography. *G.Z.* **2** (1896): 95–106. **Oppel.**

Übersichten der Wirtschaftsgeographie. Wirtschaftsgeographische Begriffe und Zahlenwerte. Von A. Oppel, in Bremen.

Historical—Cosa's Map. *B.S.G. Madrid* **37** (1895): 473–480. **Navas.**

Juan de la Cosa y su Mapa-Mundi. Por el Conde de las Navas. (Summary.)

Historical—Dortsman's Voyage. ———

Bijd. Taal-, Land- en Volkenk. Ned.-Indië (6) **2** (1896): 246–279.

Documenten betreffende de ontdekkingstochten van Adriaan Dortsman beoosten en bezuiden Banda, op last van Antonio Van Diemen en Cornelis Van der Lijn ondernomen in 1645 en 1646; medegedeeld door Mr. J. E. Heeres.

Historical—Masudi. *J. Asiatique* (9) 7 (1896): 133–144. **Vaux.**
Note sur un ouvrage attribué à Maçoudi. Par M. le baron Carra de Vaux.

Historical—Mendaña's Voyage. *B.S.G. Madrid* 37 (1895): 411–426. **Duro.**
Relación breve de lo sucedido en el viaje que hizo Alvaro de Mendaña en la demanda de la Nueva Guinea, la cual ya estaba descubierta por Iñigo Ortiz de Retes, que fué con Villalobos de la tierra de Nueva España el año de 1544. Por D. Cesáreo Fernández Duro (1567 á 1569).

BIOGRAPHY.

Capitaine. *Rev. G.* (1896): 241–255. **Drapeyron.**
Les Capitaine, gardiens du dépôt de l'observatoire et collaborateurs de Cassini pour la carte générale de la France. Par L. Drapeyron. *With Portrait.*

Pedro II. of Brazil. ———
Homenagem do Instituts Historico e Geographico Brazileiro á Memoria de sua Magestade o Senhor D. Pedro II. Rio de Janeiro, 1894. Size 9½ × 6½, pp. cxliv. and 804. *Portrait. Presented by the Brazilian Institute of History and Geography.*
A collection of press notices and various references to the last Emperor of Brazil.

Sinclair. *J.R. Agricultural S.* (3) 7 (1896): 1–21. **Sinclair.**
Sir John Sinclair, Founder and President of the First Board of Agriculture. By the Ven. Archdeacon Sinclair, D.D. *With Portrait.*

Tasman. **Walker.**
Abel Janszoon Tasman: his Life and Voyages. Read before the Royal Society of Tasmania, November 25, 1895. By James Backhouse Walker. Hobart, 1896. Size 8½ × 6, pp. vi. and 56. *Maps.*

GENERAL.

Educational Maps. *G.Z.* 2 (1896): 203–209. **Hözel.**
Wert und Verwendung der Spezialkärtchen in unseren Schulatlanten. Von Dr. E. Hözel. *With Maps.*

Gazetteer. **Rousselet.**
Nouveau Dictionnaire de Géographie Universelle. . . . ouvrage commencé par M. Vivien de Saint-Martin, et continué par Louis Rousselet. Supplément, 1er Fascicule, AA—Algarve; 2e Fascicule, Algarve—Appingadam; 3e Fascicule, Appingadam—Balkans. Paris: Hachette & Co., 1895–96. Size 13½ × 10.
The commencement of a new supplement to this well-known gazetteer.

Gazetteer. **Penzler.**
Ritters geographisch-statistisches Lexikon über die Erdteile, Länder, Meere, Buchten, Häfen, Seeen, Flüsse, Inslen, Gebirge, Staaten, etc. Achte . . . Auflage. Unter der Redaktion von Johs. Penzler. Erster Band. A—K. Leipzig: Otto Wigand, 1895. Size 11 × 7½, pp. vi. and 1064.
This is an extremely compact yet comprehensive Gazetteer, including the whole world.

General Geography. **Heiderich.**
Die Erde. Eine allgemeine Erd- und Länderkunde. Von Dr. Franz Heiderich. Vienna, etc. A. Hartleben, 1896. Size 9 × 7, pp. xiv. and 876. *Maps, Plans, and Illustrations. Price* 20 *mark. Presented by the Publisher.*

Geographical Exhibition. *M.G. Ges. Hamburg* 11 (1896): 29–40. **Michow.**
Die Geographische Ausstellung auf dem internationalen Geographen-Kongress in London, 1895. Von H. Michow.

Geographical Method. *Science* (N.S.) 3 (1896): 1–13. **Gilbert.**
The Origin of Hypothesis, illustrated by the Discussion of a Topographic Problem. By G. K. Gilbert. *With Plates.*

Geographical Names. *G.Z.* 2 (1896): 158–163. **Egli.**
Die Seele der geographischen Namen. Von J. J. Egli.

Historical—British Empire. **Lord.**

The Lost Possessions of England. Essays in Imperial History. By Walter Frewen Lord. London: R. Bentley & Son, 1896. Size 8 × 5½, pp. x. and 326. *Price* 6*s*.

An account of the circumstances in which Dunkirk, Tangier, Minorca, Cuba, Manila, Corsica, Buenos Ayres and Montevideo, Java, and the Ionian Isles were relinquished after having been British possessions.

International American Conference. ———

International American Conference. Reports of Committees and Discussions thereon. 4 vols. Vol. iii., Excursion Appendix. Narrative of the Tour of the Delegates through the United States; together with descriptions of places visited, and Reports of Addresses delivered. Vol. iv., Historical Appendix. The Congress of 1826, at Panama, and subsequent movements towards a Conference of American Nations. Washington, 1890. Size 12 × 9½, pp. (vols. i. and ii.) 1204; (vol. iii.) 344; (vol. iv.) 376.

Mediterranean Winter Resorts. **Reynolds-Ball.**

Mediterranean Winter Resorts. A Practical Handbook to the principal Health and Pleasure Resorts on the Shores of the Mediterranean. With special articles on the Principal Invalid Stations by Resident English Physicians. By Eustace A. Reynolds-Ball. With a map of the Mediterranean, and several Diagrams. Third Edition. London: Paul and Co., 1896. Size 7 × 4½, pp. xii. and 411. *Price* 5*s*. *Presented by the Publishers.*

The data concerning the innumerable health resorts in the countries bordering on the Mediterranean—both European and African—appear to have been compiled with much care, and should prove useful to many people "in search of a climate."

Patent Laws. **Wise.**

Gleanings from Patent Laws of all Countries, with information as to points of practice, area, population, productions, etc. By W. Lloyd Wise. First Portion: Argentine Republic—Germany. (Twenty-two Countries.) London: Cassell & Co., 1895. Size 7½ × 4½, pp. 208. *Price* 2*s*. *Presented by the Author.*

Philology. **Muller**

Beiträge zur Lehre der Wortzusammensetzung im Griechischen, mit Excursen über Wortzusammenstellung im Indo-germanischen, und in verschiedenen anderen Sprachfamilien. Von Dr. H. C. Muller. Leiden: A. W. Sijthoff, 1896. Size 9½ × 6½, pp. 60. *Presented by the Publishers.*

Proposed Description of British Islands. **Mill.**

Proposed Geographical Description of the British Islands based on the Ordnance Survey. By Hugh Robert Mill, D.Sc. From the *Geographical Journal* for April, 1896. Size 10½ × 6½, pp. 22.

Routes from Copenhagen. *G. Tidskrift* **13**, 1895–96 (1896): 93–99. **Madsen.**

Om Betydningen af Landenes geografiske Forhold for deres Magtomraade. Af Oberst Emil Madsen. *With Map.*

The paper is illustrated by an isochronic distance map of Europe, showing the time required to reach the various parts of the continent from Copenhagen.

Scientific Classification. *American Naturalist* **30** (1896): 101–112. **Cope.**

The Formulation of the Natural Sciences. By E. D. Cope.

Although mainly referring to Natural History, the systems of classification dealt with may also prove useful in Geography.

Submarine Cables. *National G. Mag.* **7** (1896): 102–107. **Herrle**

The Submarine Cables of the World. By Gustave Herrle. *With Chart.*

The Madagascar and Mauritius cables are not shown on this chart

Sixth International Geographical Congress. **Paulitschke.**

Der sechste internationale geographische Congress zu London (26 Juli bis 3 August 1895). Von Philipp Paulitschke. Size 9 × 6, pp. [34]. *Presented by the Author.*

Theory of the State. **Smith.**

The Theory of the State. By George H. Smith, of Los Angeles, California.—Proc.

American Philosophical Soc., vol. xxxiv., July, 1895, No. 148. Philadelphia: MacCalla & Co. Size 9 × 6, pp. [162.]

Travels. **Brehm.**

From North Pole to Equator, Studies of Wild Life and Scenes in many lands. By the Naturalist-Traveller, Alfred Edmund Brehm. Translated from the German by Margaret R. Thomson, edited by J. Arthur Thomson. London: Blackie & Son, 1896. Size 10 × 7, p. 592. *Illustrations. Price* 21*s. Presented by the Publishers.*

This will be specially noticed.

Tsetse Fly-Disease. *Nature* **53** (1896): 566–568. **Blandford.**

The Tsetse Fly-Disease. (*Illustrated.*) By Walter F. H. Blandford.

NEW MAPS.

By J. Coles, *Map Curator*, R.G.S.

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Publications issued since April 7, 1896.

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London—Re-survey, VIII. 98; XII. 6; XV. 76, 85, 94; XVII. 6, 2*s.* 6*d.* each. (*E. Stanford, Agent.*)

Germany. **Lepsius.**

Geologische Karte des Deutschen Reichs, auf grund der unter Dr. C. Vogels Redaktion in Justus Perthes' Geograph. Anstalt ausgeführten Karte in 27 Blättern in 1: 500,000 or 7·9 stat. miles to an inch. Bearbeitet von Dr. Richard Lepsius, o. ö. Professor an der Technischen Hochschule und Direktor der Geologischen Landesanstalt in Darmstadt. Lieferung VII., Blatt 13, Hannover; Blatt 14, Berlin. Lieferung VIII., Blatt 6, Emden; Blatt 7, Hamburg. Gotha: Justus Perthes, 1896. *Price* 3*s. each part.*

ASIA.

China. **Bretschneider.**

Map of China and the surrounding Regions. Compiled from the latest information by E. Bretschneider. To illustrate the author's "History of Botanical Discoveries in China," 1896. Scale 1 : 4,500,000 or 71 stat. miles to an inch. Engraved and printed by A. Iliin, St. Petersburg. 4 *sheets. Presented by the Author.*

This is a general Map of China, on which many of the routes followed by travellers are laid down. The importance of towns is indicated by symbols and the type in which their names are printed. A full explanation of the symbols employed is given, as well as of some of the Chinese geographical terms.

The map is clearly drawn, but the boundary between Burma and China is not correctly laid down.

Syria—Mesopotamia, etc. **v. Oppenhein.**

Routenkarte einer Reise von Damaskus nach Bardād ausgeführt im Jahre 1893, von Dr. Max Freiherrn von Oppenhein. Scale 1 : 1,200,000 or 18·9 stat. miles to an inch. Petermann's 'Geographische Mitteilungen,' Jahrgang, 1896, Tafel 5. Gotha : Justus Perthes, 1896. *Presented by the Publisher.*

AFRICA.

Angola. **Commissão de Cartographia, Lisbon.**

Provincia de Angola. Carta dos Districtos de Benguella e Mossamedes, 1895. Scale 1 : 1,000,000 or 15·9 stat. miles to an inch. Commissão de Cartographia, Lisbon. 4 *sheets. Presented by the Commissão de Cartographia, Lisbon.*

From the list of explorers given whose routes are laid down on this map, it would appear that the best authorities have been consulted in its construction. It is printed in colours, the hills in brown, water blue, and explorers' routes in red. The heights are indicated in figures, and ordinary trade routes by black lines. The capitals of districts, mission stations, military posts, etc., are shown. The map appears to have been carefully compiled, and all the latest material used.

German East Africa. **Krauss.**

Spezialkarte von Deutsch-Ostafrika. Entworfen und bearbeitet von P. Krauss. Berlin, W., 1896. Simon Schropp'sche Landkarten-Handlung. Scale 1 : 2,000,000 or 31·6 stat. miles to an inch. *Presented by the Author.*

Mozambique. **Commissão de Cartographia, Lisbon.**

Reconhecimento hydrographico da Barra do Rio Licungo (M'Gondo). Lat. 17° 37·5′ Sul., Long. 37° 22·5′ E. Green. Scale 1 : 10,000 or 6·3 stat. miles to an inch. Levantado em Julho de 1893 por J. Affreixo, 1° ten^{t} da armada. Commissão de Cartographia, Lisbon, 1895. *Presented by the Commissão de Cartographia, Lisbon.*

Portuguese South-East Africa. **Noronha.**

Esboço da Carta do Districto de Lourenço Marques. Dedicada ao Sr. Capitão Tenente da Armada João do Canto e Castro da Silva Antunes. Concluida sob a patrocinio do Sr. Engenheiro hidrographo Ernesto de Vasconcellos. Por Eduardo de Noronha. Tenente de infanteria. Scale 1 : 250,000 or 3·9 stat. miles to an inch. 3 *Sheets. Presented by J. Batalha-Reis, Esq.*

The names of the numerous explorers from whose surveys this map has been compiled are mentioned underneath the title. The soundings round the coast are laid down, and insets of Lourenço, Marques, and Villa do Ressano Garcia are given.

Sudan. **Istituto Cartografico Italiano.**

Carta del Teatro della guerra nel Sudan Egiziano tratta dalle migliori e più recenti carte militari inglesi per cura dell' Istituto Cartografico Italiano. Scale 1 : 2,000,000 or 31·7 stat. miles to an inch. E. Voghera, editore. Roma, 1896. *Price* 1 *li. Presented by the Istituto Cartografico Italiano, Rome.*

Transvaal. **Troye.**

Troye's Map of the Transvaal or S.A. Republic. Scale 1 : 500,000 or 7·9 stat. miles to an inch. Engraved by Wurster, Randegger & Co. (J. Schlumpf), Winterthur. Published for Messrs. Fehr and Du Bois, Pretoria, S.A.R. Sole Proprietors of copyright. London : E. Stanford. Revised edition, 1896. *Presented by E. Stanford, Esq.*

This is the second edition of a map which was noticed at some length in the *Geographical Journal* for February, 1893. The railway between Natal and Johannesburg is not shown. So far as possible, the boundaries of landed property have been laid down, with their names; but, owing to want of reliable information, the map is in this respect somewhat incomplete. On the north-west corner there is an inset of South Africa, drawn on one-tenth of the scale of the principal map.

Transvaal. **Smulders.**

Kaart van de Zuid Afrikaansche Republiek (Transvaal). Scale 1 : 1,500,000 or 23·6 stat. miles to an inch. Uitgave J. Smulders & Co., den Haag. Januari 1896.

AUSTRALIA.

Coolgardie Goldfields. **Vogan.**

Map of the Coolgardie Goldfields, compiled and drawn by Arthur J. Vogan, from original observations, and those of R. Brazier, Carnigie, D. Lindsay, and others. Scale 1 : 633,600 or 10 stat. miles to an inch. George Robertson and Co., Publishers, Melbourne, Sydney, Adelaide, Brisbane, and London, 1896. *Presented by the Author.*

Persons who are interested in the Western Australian goldfields will find this a useful map. The location of the several mining claims are indicated and numbered, but there is nothing on the map to show what these numbers refer to. The positions of condensers, places where good water and camel-feed are to be found are indicated, as are also some of the geological features.

PACIFIC OCEAN.

Pacific Ocean. **Deutsche Seewarte.**

Stiller Ozean. Ein Atlas von 31 Karten, die physikalischen verhältnisse und die Verkehrsstrassen darstellend, mit einer erläuternden Einleitung und als Beilage zum Segelhandbuch für den Stiller Ozean. Herausgegeben von der Direktion. Hamburg: L. Friederichsen and Co., 1896. *Presented by Dr. G. Neumayer.*

This is the last of a series of physical atlases of the oceans issued by the German Admiralty, and which have been compiled under the direction of Dr. Neumayer. It is to be supplemented by a volume of explanatory text, which will be published during the present year. The material from which this atlas has been compiled has been mainly drawn from the records of German sailors, but where necessary, those of other nations have been employed. The atlas contains thirty-one charts, showing the depths, currents, temperatures, winds, magnetic elements, and rainfall. In the explanatory notes preceding the charts, the authorities consulted are given, as well as a general description of the charts. The construction of these charts must have entailed a vast amount of work, and they will doubtless prove of great service to seamen navigating the Pacific Ocean, and to all students of physical geography.

PHOTOGRAPHS.

St. Helena. **Swinton.**

Thirteen photographs of the Island of St. Helena, taken by Colonel A. Swinton, R.A. *Presented by Colonel A. Swinton, R.A.*

This is an interesting series of photographs illustrating the scenery of the Island of St. Helena. Among them are views of Longwood, Napoleon's tomb, Lemon Valley, Sandy Bay, Old Woman's Valley, together with several photographs of natives and their dwellings.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

SKETCH MAP OF THE SHAN STATES

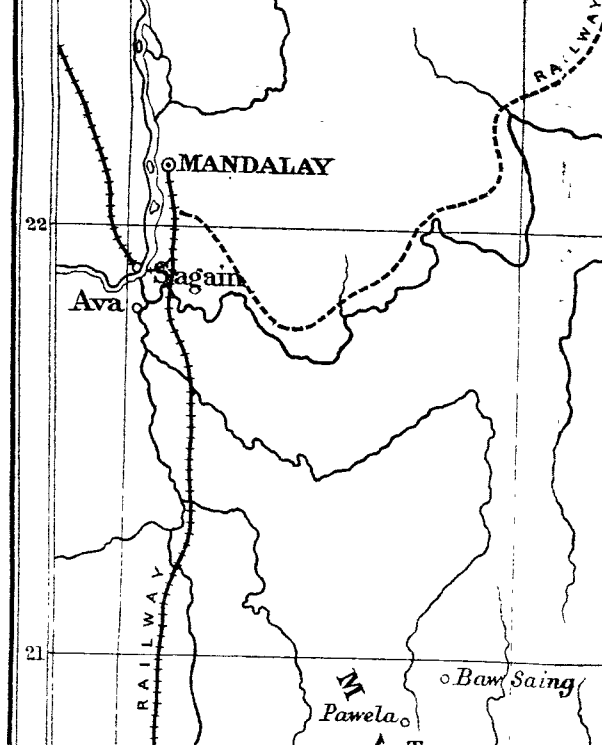
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Colonel R. G. Woodthorpe, C.B, R.E.

Scale of Miles.
10 0 10 20 30 40 50
1: 2,000,000 (31.56 m. = 1 in.)

96 97 98 99 100 101

24 23 22 21 20 19

BHAMO
SALWIN R.
Shweli R.
Kun Lon (Ferry)
IRRAWADI R.
LINE OF CONSTRUCTION
RAILWAY IN COURSE
RAILWAY
MANDALAY
Sagain
Ava
Legya
Takaw (Ferry)
Mong-pu-awn
Mong Hsen
Keng Hkam (Ferry)
1200
Baw Saing
Pawela
Taung-gyi
Sa On
Mong Pawn
Ban Ping
Inlé Lake
Ft Stedman
Moné
Nam Teng
Nam Pawn
Nam Hka
Nam Pang
Nam Hsin
Batu Chaung
KARENNI
Ta Hué Pon
Nam Hka
Nam Lwi
Nam Lan
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Mong Hsin
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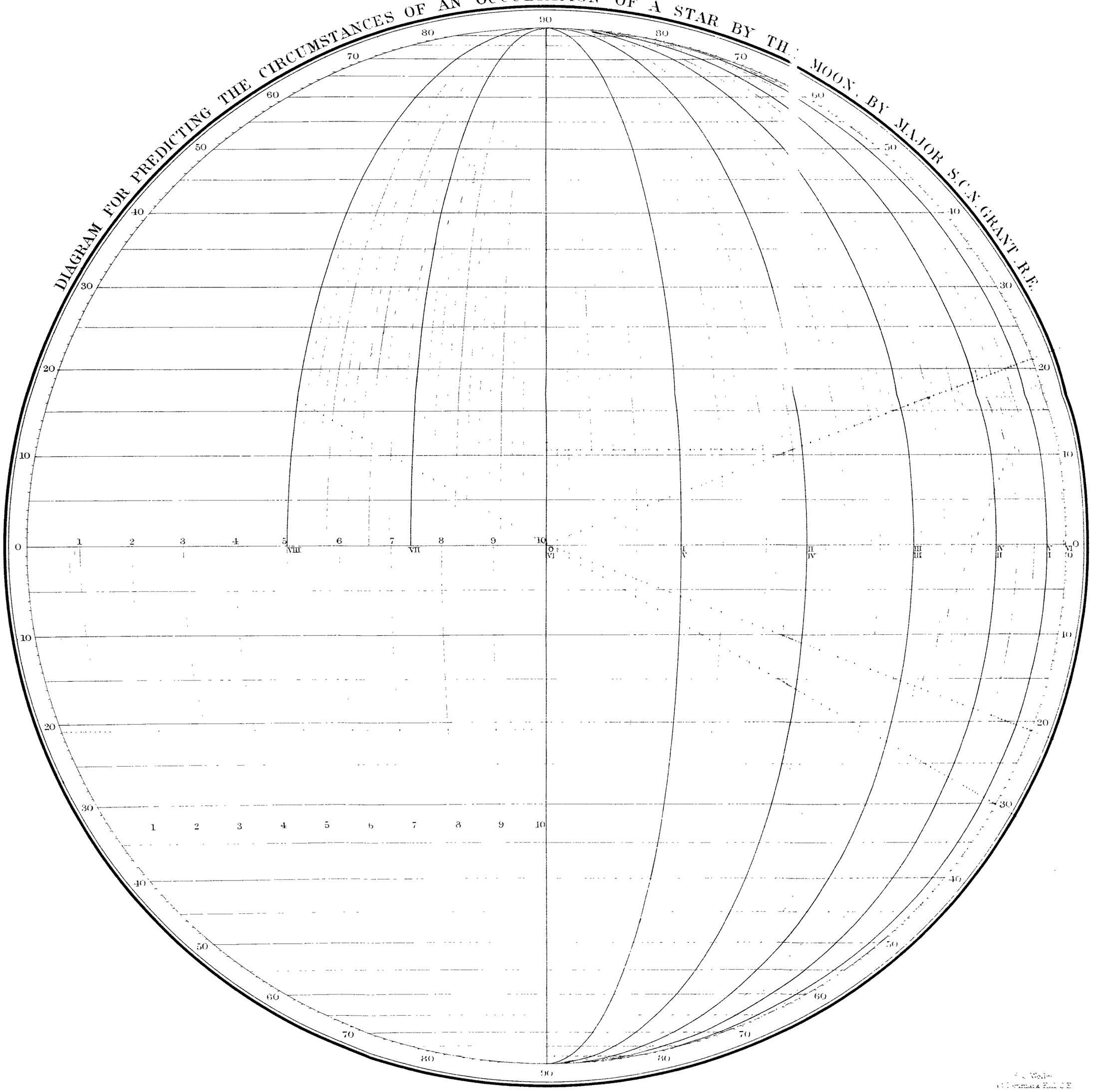
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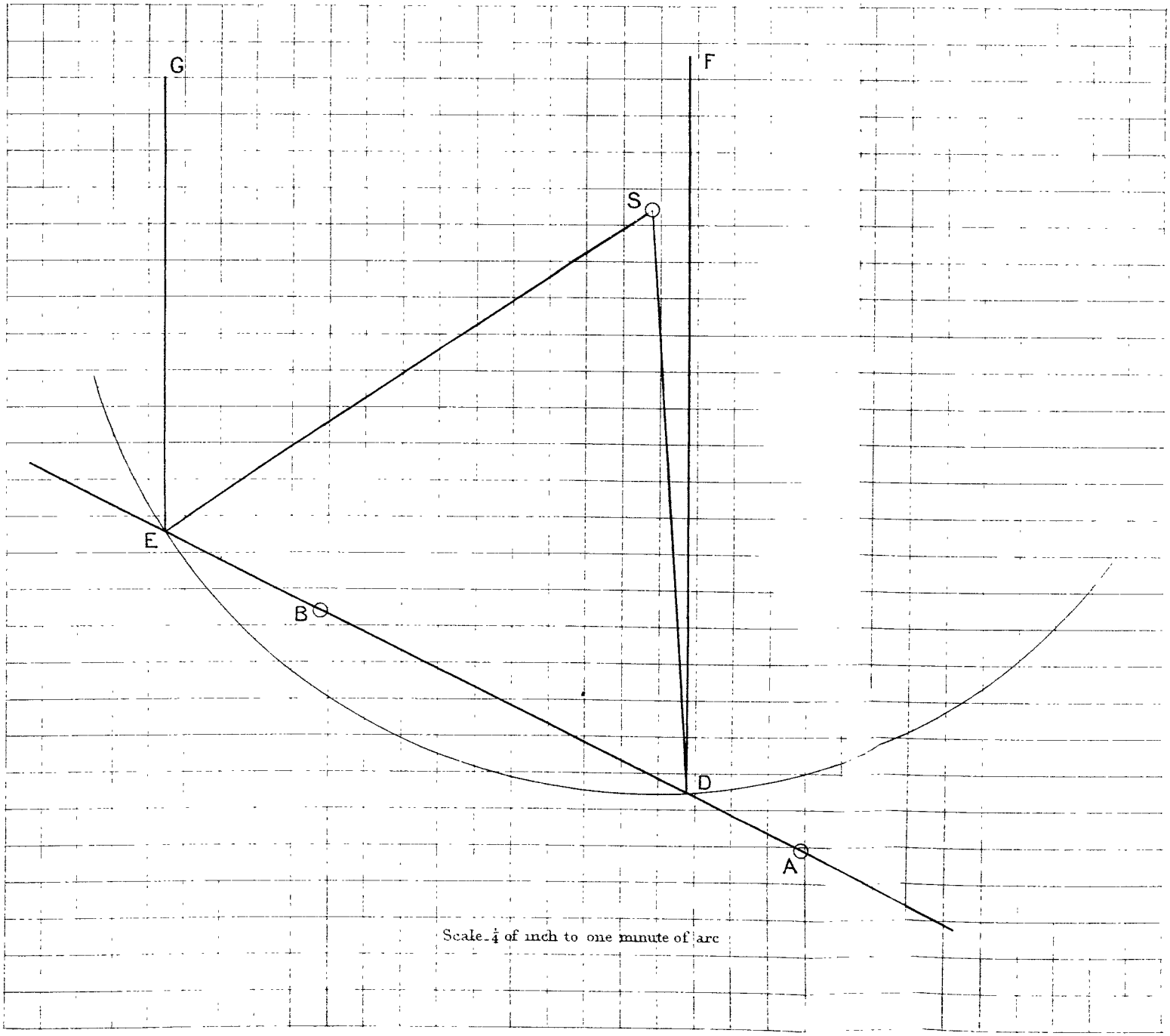
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G
F
S
E
B
D
A
Scale $\frac{1}{4}$ of inch to one minute of arc

INDEX.

A.

ABADEH, Persia, 172
Abbe, Mr. C., on the Capes of the Carolina Coast, 319, 334, 557
Abbildung der Halbkugeln, Zur, von Dr. Bludau (New Publications), 219
Abbott, Lieut.-Col., Census of India, 1891, Report, etc. (New Publications), 329
Abich, Dr., Caucasian travels of, Mr. Freshfield's remarks on, 656
Abo-toge pass, Japanese Alps, 128
Abulfeda's account of Kais, 648
Aburrow, Ch., Bi-Annual Report, etc., of Johannesburg Sanitary Committee (New Publications), 215
Abyssinia, New Maps—
  Nubia and Abyssinia, to illustrate Dongola Expedition, by W. and A. K. Johnston, 573
  Nuova Carta . . . nell' Eritrea e Regioni Limitrofe, 450
  Schizzo del Teatro della Guerra Italo-Abissina, 573
Abyssinia, New Publications—
  Die heutiger Lage der Italiener in Abessinien, von Dr. Paulitschke, 442
  Le Dembélas, by Colonel C. Airaghi, 678
Abyssinians, Glaser on the, Review, 420
Active and *Balæna*, Cruise of the, in Antarctic Seas, by W. S. Bruce, 502 *et seq.*; by C. W. Donald, 625 *et seq.*
Active sound, Antarctic, 632, 633
Ada river, Darfur, 428, 429
Adam, C. et H., Lettres de C. Huygens à Descartes (New Publications), 222
Adamawa, von Dr. Siegfried Passarge, review of, 272
Adi, Wadi, 522
Adige, New Publications—
  Die Etsch, von A. Penck, 109
Admiralty Charts (New Maps), 122, 343, 575
Admiralty Charts, New Publications—
  Catalogue of, 447
Afghanistan, Notes on, Major Raverty's, 547
Afghanistan, New Publications—
  At the Court of the Amir, by J. A. Gray, 212
Africa—
  British Central, boundaries of, 367; plateau land of, 367; labour question in, 374; progress in, 376, 377; natives, 376, 377; Arab question in, 378; minerals, 378; colonization of, 379, 380; slavery in, 381; industries, 385
  British Central, Geography and Resources of, by Alfred Sharpe, 366 *et seq.*
  British Central, A visit to Lake Chiuta in, by B. Codrington, 183
  Ethiopian Faunal Region of, 282 *et seq.*
  General Chapman's proposed mapping of, 414, 550
  Large mammals of, 285
  Mr. Scott-Elliot's book on, Note on, 660
  Old map of, published at Amsterdam, Dr. Peters on, 202
  South, photographs of, by Dr. E. Holub, 124
  West, Miss Kingsley's travels in, 95
Africa, New Publications—
  A Journey in West Africa, etc., by Capt. Lugard, 114
  A Naturalist in Mid-Africa, by G. F. Scott-Elliot, 331
  Aequatorial- und Süd-Afrika nach einer Darstellung von 1719, von Dr. C. Peters, 214
  Africa as a Field for Colonial Enterprise, by G. F. Scott-Elliot, 112
  Argus Annual and S. African Gazetteer, 564
  Big Game of South Africa, 332
  Commercial Prospects of British Central and East Africa, by G. F. Scott-Elliot, 678
  Der Ochsenwagen in Ostafrika, von J. Graf Pfeil, 213
  Development of Tropical Africa, by Sir G. Baden-Powell, 679
  Durch Afrika von Ost nach West, von Graf von Götzen, 442
  Encore la question de la priorité de la découverte de l'Afrique Centrale, par A. Wauters, 113
  Extension of British Influence in Africa, by Capt. Lugard, 112
  Fate of South Africa, by F. R. Harris, 445
  Geschichten und Lieder der Afrikaner von A. Seidel, 678

Africa, New Publications—*continued.*
In Haunts of Wild Game, by F. V. Kirby, 332
L'Afrique australe et la colonization néerlandaise, par Dr. Ivens, 215
La Colonizzazione dell' Africa tropicale, by Prof. Sitta, 333
La traversée de l'Afrique Centrale, par Comte von Götzen, 331
Les Traités . . . en Afrique Centrale, von H. Schirmer, 442
Meteorologischen Beobachtungen . . . Marangu, 563
"Neue Aufnahmen deutscher Offiziere in Usagara," etc., von R. Kiepert, 563
New British Markets, III. Tropical Africa, by Capt. Lugard, 113
Padroado de Portugual em Africa, by Rev. de Himeria, 443
Possessi e Protettorati in Africa, 443
Proposed German Barrier across Africa, by Dr. J. W. Gregory, 332
Résultats scientifiques des voyages de M. Mizon, 214
Sept ans d'Afrique, La mission du Capt Marchand, 114
South Africa, A Study in Colonial Administration, by W. Worsfold, 215
Stanford's Compendium of Geography and Travel, South Africa, by A. H. Keane, 113; *see also* 275
The Problem of the Races in Africa, by Lieut.-Colonel Elsdale, 678
Travels on Western Coast of Equatorial Africa, by Miss M. W. Kingsley, 564
Twelve Hundred Miles in a Waggon, by Alice B. Balfour, 332
Ueber die Ulugururberge in Deutsch-Ostafrika, von Dr Stuhlmann, 214
Weissbuch. Sechszehnter Theil, 442
Zur Frage der Austrocknung Afrikas, von P. Reichard, 112
Zur Namenkunde von Deutsch-Süd-Westafrika, von P. H. Brincker, 332
Africa, New Maps—
Central and South, Bartholomew's New Map of, 342
Expedition des Deutschen Kamerun-comités, von Dr. Passarge, 451
Karte von Deutsch-Ostafrika, von Kiepert und Moisel, 450
Reiseweg des Lieut Graf von Götzen in Deutsch-Ostafrika, 450
Spezialkarte von Deutsch-Ostafrika, von P. Krauss, 687
Africains, Nos explorateurs, par A. M. (New Publications), 339
African books, recent, by Ed Heawood, 270
——— lakes and rivers, desiccation of, 367
——— natives, capabilities of, 386
——— Pioneers, The, by Capt. Pasfield Oliver (New Publications), 331
——— Subregion, West, of the geography of mammals, 290
Afternoon Technical Meetings of R.G.S., 106, 437, 559
Agro-Romano, New Publications—
Storia fisica dell Agro Romana, dell Dottore Angelis d'Ossat, 561
Ahlenius, K., Olaus Magnus' framställning . . . geografi (New Publications), 568
Ainsworth, J., on a Journey from Machako's to Kitwyi, 406
Air dans le sol, Sur la circulation de l', par M. M. Dehérain et Demoussy (New Publications), 448
Air, temperature of the, 542
Airaghi, Colonel C., Le Dembélas (New Publications), 678
Aische-en-Refail, New Publications—
Étude de Géographie locale, par Ed. Verhelst, 327
Aiya, V. Nagam, Report on the Census of Travancore (New Publications), 330
Akabat et Kahza, 524
Akka-Tagh, Tibet, 460, 462
Al Birain, 523
Al Haijar, Oman, 536
Al Makuba pass, Oman, 531
Alaska, New Publications—
Alaska as it was and is, by W. H. Dall, 333
Alexander, Cape, Antarctic, 633, 634
Alexander the Great, Life and Exploits of, by E. Wallis Budge (New Publications), 449
Algeria, M. Foureau's journey south of, 663
Algeria, New Maps—
Carte topographique de l'Algérie, 228
Algeria, New Publications—
The Shotts of Algeria and Tunis, 678
Algeria and Tunis, M. Gain's report on the influence of Drought on Vegetation, 430
Algeria and Tunis, New Publications—
Handbook for Travellers in, by Sir Lambert Playfair, 213
Mission . . . en Algérie et en Tunisie, par M. E. Gain, 331
Algué, P. José, Observatorio de Manila, Baquios ó Tifones de 1894 (New Publications), 213
Al-Kais, or Kais, Persian Gulf, 644
Allingham, W., Fast Passages and Best Routes (New Publications), 567, 571
Allison, Th., Early Ascent of Ruapehu (New Publications), [illegible]
Alme, [illegible] den Wellmanske polarexpedition (New Publications), 117
Alpinen Kartographie, Zur, von L. Obermair (New Publications), 218
Alps, Southern, of New Zealand, First crossing of the, by E. FitzGerald, 483 *et seq.*
Alps, New Publications—
Aus den Bergen der Maurienne und der Tarentaise, von Blodig und Purtscheller, 106
La recoloration des Alpes, par M. H. Dufour, 219

Alps, New Publications—*continued.*
Lignes directrices de la chaîne des Alps, par M. Haug, 326
Zur Alpinen Kartographie, von L. Obermair, 218
Alpsee, depth, etc., of, 199
Alsace-Lorraine, New Publications—
Niederschlagsverhältnisse im Ober-Elsass, von O. Rubel, 327
Untersuchungen über die Bodentemperaturen, von W. Boller, 327
Amakhosa, New Publications—
Les Ma-Khoça, par P. Jeanneret, 563
Amaral, Ferreira de, Luciano Cordeiro, and E. de Vasconcellos, Biographies of (New Publications), 119
Amazons, New Publications—
Der Amazonas, von D. von Schütz-Holzhausen, 335
Amber, Der Bernstein, von C. Mauch (New Publications), 570
Amda, Wadi, 523
America, New Publications—
Amerika, Eine allgemeine Landeskunde, von Deckert, Kükenthal und Sievers, 215
Deutsche Kolonisation in Südamerika, von Dr. Wiegand, 217
Die Zahl der Weissen im tropischen Amerika, von A. Oppel, 217
Geographischen Forschung in Nord-Amerika, von Dr. Deckert, 215
How the Latin-American Markets may be reached by the Manufacturers of the United States, 680
International American Conference, 679
Manual de las Repúblicas Americanas, 680
Menedez' Travels in, by F. Fonck, 681
American Conference, International, Reports of Committees, etc. (New Publications), 685
American Geographical Monographs, 319
American Republics, Bureau of the, Manual, Handbooks, Bulletins, etc. (New Publications), 680
American Schools, Local Maps in, Prof. Davison, 665
Amu-darya, source of the, 197
Amurprovinz, Die, von Hauptmann Immanuel (New Publications), 213
Anarak, height of, 166
Anatolia, New Publications—
Die Grundlinien Anatoliens und Centralasiens, von Dr. Naumann, 329
Reisen in Anatolien, von Dr. Naumann, 329
Andalusia: *see* Spain
Anderson and Dunn, Messrs., Reports on the Conglomerate Prospection Expedition, British Guiana (New Publications), 445
Anderson, N., Færøerne, 1600–1709 (New Publications), 327
Andes, New Publications—
Viaje a los Andes Australes, por R. Lista, 682
Andrade, J., Nouvelles manifestations mécaniques de la rotation de la Terre (New Publications), 219
———, Sur une amplification mécanique . . . de la rotation de la Terre (New Publications), 219
Andrée, M., projected balloon voyage across the North Pole, 206, 325
———, Förslag till polarfärd med luftballong (New Publications), 567
———, Iakttagelser under en ballongfärd (New Publications), 448
Andros, par H. Hauttecœur (New Publications), 108
Anglo-Afghan Frontier Agreement, 546, 674
Anglo-Siamese boundary, 299
Angola, New Maps—
Carta dos Districtos de Benguella e Mossamedes, 687
Angola, New Publications—
L'Angola et la colonisation portugaise, par Ch. Delannoy, 678
La colonie portugaise d'Angola, par Dr. Rouire, 215
Angoni tribe, Central Africa, 370, 371
Angot, M., Sur le régime pluviométrique de l'Europe occidentale (New Publications), 110
Ani, Die Altarmenische Hauptstadt, von Krahmer (New Publications), 213
Annales de Géographie, Bibliography published by the, 74
Annam au Mékong, De l', par E. Mercié (New Publications), 111
Année Cartographique, L', par F. Schrader (New Maps), 342
Annenkoff, Général, Conférence sur l'importance de la Géographie, etc. (New Publications), 119
Anno Bon island, fauna of, 283
Anomalurus of Africa, 285
Anrique, N., Bibliografía Marítima Chilena (New Publications), 445
Antarctic—
Analysis of waters of the, 518
Cruise of the *Balæna* and *Active* in the; Part I., the *Balæna*, by W. S. Bruce, 502 *et seq.*; Part II., the *Active*, by Ch. W. Donald, 625 *et seq.*
Expedition to the, under Mr. Borchgrevink, 205, 325
Whales in the, 507; icebergs, 510, 511; colour of the sea, 512; currents, 513; meteorology, 513, 515; birds of the, 518; table of soundings, 519; table of temperatures, 520
Antarctic, New Publications—
Das unbekannte Südland, von Prof. Ruge, 337
Deutsche Expedition der Süd-Polar-Region, 337
Die Erforschung des Dirk Gerritsz-Archipel, von Dr. J. Petersen, 447

Antarctic, New Publications—*continued.*
Kapitän A. Larsens antarktische Forschung, 337
La zone polaire Australe, par J. Du Fief, 682
Marine Fauna of the Kerguelen Region, etc., by John Murray, 337, 538
Surviving Refugees . . . of Antarctic Life, by C. Hedley, 337
Zur Südpolarforschung, von F. Mewius, 447
Antelopes of the Ethiopian Region, 285
Anthropo-geography, New Publications—
Die Lage der menschlichen Ansiedelungen, von A. Hettner, 118
Anthropology, Prof. Keane's work on, 433
Anthropology, New Publications—
Du rôle de la femme dans la colonisation, par M. Lemire, 118
History of Mankind, by F. Ratzel, 118
Sia and Tusayan Snake Ceremonials, by J. W. Fewkes, 118
Antilles, Exploration aux, par M. P. Vibert (New Publications), 335
Arab invasion of Makran, 391, 392
Arab question in African colonization, 378
Arabia, Journal of an Excursion in Oman in, by Col. S. B. Miles, 522 *et seq.*
Arabia, New Publications—
Arabia and Abyssinia in Ancient Times, by J. W. M'Crindle, 570
Arabs of Oman, 533
Arad, New Publications—
Land und Leute des Comitates Arad, von Dr. Jankó, 561
Arana, D. B., La Cuestion de Limites entre Chile i la República Arjentina (New Publications), 217
Ararat, by W. Rickmer-Rickmers (New Publications), 110
Arbo, C., Udsigt . . . Norges anthropologiske forhold (New Publications), 439
Archinard, M., Le campagne 1892-93 au Soudan français (New Publications), 332
Arctic Expeditions—
Dr. Nansen's, 317, 555
Arctic Ocean, Lieut. Zhdanko on hydrographic researches in the, 555
Arctic Seaman, Honour to an, 556
Arctic, New Publications—
Arctic Cruise of the *Bear*, by Dr. S. Jackson, 447
Handbook of Arctic Discoveries, by General A. W. Greely, 566
Isforholdene i Nordhavet, af Carl Ryder, 447
Nagra anteckningar, etc., af A. Ohlin, 447
Om Björlings och Kallstenii expedition, af G. Nordenskiöld, 447
Om väderleksförhallandena . . . luftballong, af N. Ekholm, 567
Scope and Value of Arctic Explorations, by General Greely, 447
Tides of the Arctic Seas, by Rev. S. Haughton, 337
Argentine Government's surveys on the Pilcomayo, 83
Argentine, New Publications—
Argentinisch-chilenischen Grenzstreit, von J. J. Rohde, 680
Bureau of the American Republics: Argentine Republic, 680
Argentine and Chile, New Publications—
Chile und Argentinien in der patagonischen Kordillere, von Dr. Steffen, 217
La Cuestion de Limites entre Chile i la República Arjentina, por Arana und Valderrama, 217
Limites con la República Arjentina, by Don Ramon Montaner, 217
Armail, Armabel, or Lus Bela, 398, 399
Armenia, New Maps—
Armenian Question in Asia Minor, by W. and A. K. Johnston, 342
Verteilung der Armenischen Bevölkerung in Türkisch-Armenien, etc., von A. Supan, 342
Armenia, New Publications—
The Armenian Question, by H. Lynch, 440
Unbiassed view of the Armenian Question, by W. B. Harris, 112
Verbreitung der Armenier in der Asiatischen Türkei, nach Selenoy und Seidlitz, 440
Armenians in Asiatic Turkey and Transcaucasia, Distribution of, 312
————, percentage of, to the total population, 548
Armstrong, A., In a Mule Litter to the Tomb of Confucius (New Publications), 440.
Arnawai Valley, Central Asia, 547
Arnous, H., Gewichte, Masse, . . . in Korea (New Publications) 330
Arva, Jebel, Tripoli, 152
Arzruni, Prof., Reise nach Süd-Kaukasien (New Publications), 327
Asceusion Island, fauna of, 283
Aschersleben, Zur Sprachgrenze um, von E. Damköhler (New Publications), 10
Ashanti, New Publications—
Ashanti and the Gold Coast, by W. Scott Dalgleish, 215
Further Correspondence relating to Affairs in, 442
Ashanti Expedition, W. and A. K. Johnston's map to illustrate the (New Maps), 121
Asia, Central, Dr. Sven Hedin's Journeys in, 195
————, MM. Grum Grjimailo's journeys in, 656
Asia, New Publications—
Das Klima Centralasiens, von A. Woeikof, 677
Das Klima Ost-Asiens, von W. Krebs, 329
Die Grundlinien Anatoliens und Centralasiens, von Dr. Naumann, 329

Asia—New Publications—*continued.*
Expedition der K. Russischen Geo. Gesell. in Mittelasien, von D. Krahmer, 677
Mission . . . dans la Haute-Asie, par MM. Dutreuil de Rhins et Grenard, 329
Orography of Central Asia, etc., by M. Obruchef, 440
Problems of the Far East, by Right Hon. G. N. Curzon, 440
The Heart of a Continent, Travels in Manchuria . . . and Chitral, by Capt. F. E. Younghusband, 562
Verwitterungs- und Deflationsprocesse in Central-Asien, by B. W. Obrutschew, 562
Asia Minor, Prof. Ramsay's work in, 190
Asia Minor, New Maps—
Itinerar-Aufnahmen im nordwestlichen Kleinasien, von Diest und Anton, 226
————, North-West, photographs of, by Messrs. Munro, Anderson, and Anthony, 344
Asia Minor, New Publications—
En Phrygie, par M. Radet, 329
Neue Forschungen im nordwestlichen Kleinasien, von Diest und Anton, 329
Reisen in Anatolien, von Dr. Naumann, 329
Asiatic Turkey and Transcaucasia, Distribution of Armenians in, 312
Assa depression, low level of the, 657
Assam, Prince Henry of Orleans' Journey to, 199
Assam, New Publications—
Report on Administration of, for 1894-95..677
Assam-Burma Railways, Proposed Connection of, 202
Assmann, Dr., Ergebnisse der Gewitter-Beobachtungen im Jahre 1891 (New Publications), 108
Astronomie und Geophysik, Jahrbuch der, von Dr. Klein (New Publications), 448
Astrup, Lieut. E., Death of, 209
————, Det arktiske problem og de to Peary—expeditioner (New Publications), 117
————, von Dr. Nielsen (New Publications), 449
Athi plains and rivers, 662
Athi river, 406, 410
Atlantic, North, Bottle-Voyage, 102
Atlantic, warm axis in the, 264
Atlantic Ocean, New Maps—
Pilot Charts of the North Atlantic, 124, 452
Atlas Universal de Géographie, par F. Schrader (New Maps), 343
Atmospheric Temperature in the Southern Hemisphere, Prof. Hann on, 556
Aurora, New Publications—
Effet de l'humidité . . . de l'aurore boréale, par A Paulsen, 448
Australasian Colonies, History of the, by Ed. Jenks (New Publications), 336
Australia, South, Geological Explorations in, Mr. Brown's Report, 554
Australia, New Publications—
Aboriginal Bora held at Gundabloni in 1894, by R. H. Mathews, 116
Aboriginal Rock Pictures of, by R. H. Mathews, 116
Australia as a Strategic Base, by A. S. White, 446
Australian Fungi, etc., by D. McAlpine, 336
Australian Handbook, by Gordon and Gotch, 682
Australien und Ozeanien, von Prof. W. Sievers, 335
Discovery of, by G. Collingridge, 446
Geographical History of Australian Continent, by Hon. A C. Gregory, 682
Meteorological observations made in South Australia, by Sir C. Todd, 682
Notes on Coolgardie Gold Fields, by D. C. Chewings, 682
Scientific Exploration of Central Australia, by W. A. Horn, 446
South Australia, Government Geologist's Report, 336
Western Australia, by Sir W. Robinson, 116
————, its History and Progress, by A. F. Calvert, 566
————, Mining Handbook, by H. P. Woodward, 336
Western Australian Blue Book for 1894 ..116
———— Year-Book for 1893-94, by M. A. Fraser, 116
Year-Book of Australia for 1895, edited by the Hon. Ed. Greville, 116
Australia, New Maps—
Western Australian Goldfields (London and Western Australian Exploration Company), 451
————, by Bewick, Moreing and Co., 573
Western Australia, showing goldfields, by A. F. Calvert, 574
Austria, New Publications—
Astronomische Arbeiten der Oesterreichischen Gradmessungs-Commission, von Drs. Herr und Tinter, 106
Jahrbuch des K. K. hydrographischen Central-Bureau, 107
Leistungen der österreichischen Staatsinstitute, 438
Autruche de Barbarie, L', par J. Forest (New Publications), 442
Auvergne à l'Atlantique, De l', par Dr. Collignon (New Publications), 327
Avalanche Basin, Montana Rockies, by L. B. Sperry (New Publications), 444
Awemba country, Central Africa, 204
Ax-i-Rustam, Persia, 26
Azande tribe, 428
Azores, New Publications—
Archivo dos Açores, 560

B.

Bachem, Kapt.-Lieut., Fahrt in den Bimbia-Fluss und Reise von Kamerun (New Publications), 113
Baden-Powell, Sir G., Development of Tropical Africa (New Publications), 679
Bagdad, Freiherr v. Oppenheim's journey from Damascus to, 548, 658
Bahamas, New Publications—
The Sisal Industry in the Bahamas, by Dr. D. Morris, 566
Balæna and *Active*, Cruise of the, in Antarctic Seas, by W. S. Bruce, 502 *et seq.*
Balegga tribe, Central Africa, 273 *and note*
Balfour, Commander, Deep Soundings in the Pacific found by, 318
Balfour, Miss A. B., Twelve Hundred Miles in a Waggon (New Publications), 332
Balkan Peninsula, High-level Meteorological Station in the, 544
Ballagh, J. C., White Servitude in Virginia (New Publications), 216
Ballif, P., Wasserbauten in Bosnien und der Hercegovina (New Publications), 438
Balloon voyage to the North Pole, M. Andrée's projected, 206
Ballooning, New Publications—
A Trip Heavenward, by B. Baden Powell, 119
Contribution à la bibliographie de la locomotion aérienne, par A. Wouwermans, 223
Geographisches aus dem Luftballon, von A. Berson, 448, *see also* 541
Iakttagelser under en ballongfärd, af S. Andrée, 448
Balloons in Geographical Work, the Use of, by A. Berson, 541
Balochis, The Northern, by O. V. Yates (New Publications), 110
Baltic, Evolution of the, Prof. Credner on the, 425
Baltic, New Publications—
Entstehung der Ostsee, von Dr. Credner, 220
Hydrographie . . . der Ostsee, von Dr. Schott, 448
Baltimore, New Publications—
City Government of, by Th. P. Thomas, 444
Balu Chaung river, Shang States, 579
Baluchistan, Southern, ethnographical conditions of, 388
Ban Law ferry, Mekong, 585
Band, ancient town of, 673
Banda tribe, 428, 429
Bandassi village, position of, 429
Bangkok, New Publications—
Bangkok, von Otto E. Ehlers, 678
Bangs, O., Geographical distribution of the Cotton-tail, etc. (New Publications), 334
Bangweolo, Lake, desiccation of, 368,
Bangweolo, meaning of word, 378
Banjia tribe, 428
Bannwaldsee, depth, etc., of, 199
Barbier, M., Irrégularités orthographiques des noms de lieux (New Publications), 222
———, Rôle des voyageuses françaises (New Publications), 224
Barcones, E. M., Estudios para una Nosologia Filipina (New Publications), 112
Barents Sea, Lieut. Zhdanko on hydrographic researches in, 555
Barotse Country, Capt. Bertrand's Expedition to the, 426
———, Capt. Gibbons' explorations in the, 662
Barra do Rio Licungo, Reconhecimento hydrographico da (New Maps), 687
Barrett, C., Surrey: Highways, Byways, and Waterways (New Publications), 328
Barrow, C. L., remarks on "First Crossing of the Southern Alps of New Zealand," 501
Barsîsâ, Die Legende vom, von Drs. Goldziher und Landberg-Hallberger (New Publications), 340
Bartholomew, J. G., Joseph Thomson (New Publications), 119
———, The Royal Scottish Geographical Society's Atlas of Scotland (New Maps), 120
———, Travellers' Route Chart of the World (New Maps), 452
Bartholomew's New Map of Central and South Africa (New Maps), 342
Bas-Quercy, Une grande industrie du, par J. Gebelin (New Publications), 107
Baschin, Herr O., Geographical Bibliography of, 73
———, Zur Frage des jahreszeitlichen Luftanstauches, etc. (New Publications), 118
Bashgal valley, Central Asia, 547
Bashgol river, 42
Bassenthwaite, origin of, 616
Bassin houiller du Nord, par M. Gilles (New Publications), 438
Bastak, Persia, 25
Batak Land, geography of, 76; great lake of, 77; geology, 78; fauna and flora, 78, 80; Dutch colonization in, 80; people of, 81
Batak Land, New Publications—
De Verkenning der Bataklanden, door C. M. Pleyte Wzn, 331
Bataks, The Land of the, by Baron A. von Hügel, 75, 175; *see also* 563
Bataks: dress, ornaments, and wood-carving of, 176; houses of, 177; domestic animals of, 178; industries of, 179; social life of, 180; religions of, 180; cannibalism, 181; literature of, 182
Batavia, New Publications—
Longitude de Batavia, par J. Oudemans, 330
Bats of Madagascar, 288

Baudouin, M., Le problème bibliographique (New Publications), 223
Bauer, L. A., Halley's Earliest Equal Variation Chart (New Publications), 449
————————, On the Distribution . . . of Terrestrial Magnetism (New Publications), 219
Bebber, Dr. van, Die Wetterdienst an der Deutschen Seewarte (New Publications), 118
————————, Die Klimate der Erde und ihr Einfluss auf den Menschen (New Publications), 568
Bedford, Rev. W., Malta and the Maltese Race (New Publications), 439
Beehive mount, glacial striæ on, 55
Begg, A., Notes on Vancouver Island (New Publications), 215
Behr, H. H., Changes in Flora and Fauna (New Publications), 679
Beida, Jebel, 527
Belda, New State of, in the Central Sudan, 313
Belgian monument to Captain Coquilhat, 557
Bell, H. C. P., Report of Archæological Survey in Sigiriya (New Publications), 562
Bell, Dr. R., explorations in province of Quebec, 413
————————, Proofs of the Rising of Land around Hudson Bay (New Publications), 564
Belloc, E., Recherches et explorations, etc., dans les Pyrénées Centrales (New Publications), 109
Ben Chaung, or Nam Pang, Shan States, 580
Bénet, M., Notes pittoresques sur les îles Loyalty (New Publications), 218
Bénoué, Itinéraire de la source de la, etc., par M. Mizon (New Publications), 214
Bent, J. T., The Land of Frankincense and Myrrh (New Publications), 110
————————, Muscat (New Publications), 110
Berlin Geographical Society's Bibliography, 72
Bernard, A., L'Archipel de la Nouvelle-Calédonie (New Publications), 116
Bernardière, M. de, Sur la construction de nouvelles Cartes magnétiques, etc. (New Publications), 219
Bernstein, Der, von Chris. Mauch (New Publications), 570
Berson, A., Geographisches aus dem Luftballon (New Publications), 448
————————, The Use of Balloons in Geographical Work, 541
Berthoud, P., Lourenço Marques (New Publications), 563
Bertrand, Captain, Expedition to the Barotse Country, 426
Betydningen af Landenes geografiske Forhold, af O. E. Madsen (New Publications), 685
Bevan, Th., Discovery of the Great Purari (New Publications), 218
Bewick, Moreing, and Co., Map of the Western Australian Goldfields (New Maps), 573
Beyaza, Persia, 32
Bezold, W., Der normale Erdmagnetismus (New Publications), 568
Bibliographies, Recent Geographical, by Dr. H. R. Mill, 72
Bibliography, New Publications—
Greek Bibliography, by Sakkelionos, 223
Index to Periodicals of 1894, by Hetherington, 223
Le problème bibliographique, par M. Baudouin, 223
Torch and Colonial Book Circular, by E. A. Petherick, 223
Bibliotheca Geographica, 73
Bicknell, A. C., Travel . . . in N. Queensland (New Publications), 336
Bida, New Publications—
Visit to, Bishop Tugwell's Diary, 443
Big Game Shooting, by Clive Phillipps-Wolley (New Publications), 224
Bigelow, F. H., The Earth a Magnetic Shell (New Publications), 219
Bihé, Expedição ao, by A. de Paiva (New Publications), 214
Bimbia-Fluss, Fahrt in den, und Reise von Kamerun, von Kapt.-Lieut. Bachem (New Publications), 113
Bio-Geography of Mexico, etc., by C. H. T. Townsend (New Publications), 333
Biography, Dictionary of National, by Sidney Lee (New Publications), 449
Bioley, P., Du lac de Grenade . . . par le fleuve San Juan (New Publications), 565
Biological collections of the *Balæna* expedition, 518
Bird-catching in the Færoes, 19
Biscay, Bay of, New Publications—
Mission Scientifique dans le Golfe de Gascogne, par M. de Kergrohen, 683
Stromversetzungen vor der Bucht von Biscaya, von L. Dinklage, 326
Bismarck Archipelago, New Publications—
Languages of the, by S. H. Ray, 218
Bizerta, New Publications—
Bizerte et son nouveau port, par M. Maumené, 215
Bjelašnica peak, Meteorological Observatory on, 544
Blache, V. de la, Le principe de la géographie générale (New Publications), 340
Black, W. G., Summer Meteorology (New Publications), 338
Blackmore & Colomb, Manœuvring Powers of Steamships (New Publications), 571
Bladen, F. M., Historical Records of New South Wales (New Publications), 446
Blandford, W. F. H., The Tsetse Fly Disease (New Publications), 686
Blanford, Dr. W. T., remarks on "The Waterways of English Lakeland," 622
Blantyre, progress in, 382, 383
Bleng and Irt rivers, Lakeland, 619

Bliss, Dr., Narrative of an Expedition to Moab and Gilead (New Publications), 112
Blodgett, J. H., "Free Burghs" in United States (New Publications), 564
Blodig und Purtscheller, Drs., Aus den Bergen der Maurienne und der Tarentaise (New Publications), 106
Bludau, Dr., Ueber die Wahl der Projektionen für die Länderkarten der Hand- und Schulatlanten (New Publications), 117
————, Zur Abbildung der Halbkugeln (New Publications), 219
Bluzet, Lieut., Explorations in the Timbuktu Region, 98
————, La région de Timbouctou (New Publications), 214
Boaz, F., Sprachenkarte von Britisch-Columbien (New Maps), 342
Bogdanowitch, K., Einige Bemerkungen über das System des Kwenlun (New Publications), 331
Bogdo ola lake and peak, 657
Bogue, V. G., Stampede Pass, Cascade Range (New Publications), 444
Bokaha, New Publications—
Quelques notes sur le pays, habitants, et ses ressources, par E. Thomas, 564
Bokhara, New Publications—
Une visite à la prison de Bokhara, par M. Laurent, 329
Bolivia, New Maps—
Carta Corográfica del Departamento de, por F. Simons, 228
Bolivia, New Publications—
Bureau of American Republics, Bulletins, 680
Bolivia and Peru, Recent Discoveries in the Basin of the Madre de Dios in, by C. R. Markham, 187
Bolivia-Paraguay Frontier, Dr. Polakowsky on the, 205
Boller, W., Untersuchungen über die Bodentemperaturen (New Publications), 327
Bolton, J., The Facts about the Venezuela Boundary (New Publications), 334
Bombay, New Publications—
Magnetical and Meteorological Observations made at, 677
Bonney, T. G., Ice-Work, Present and Past (New Publications), 567
Bonnier, G., Les plantes de la région alpine, etc. (New Publications), 118
Bonola Bey, F., In Memoria di Carlo Piaggia (New Publications), 222
Borchert, O., von A. Miessler (New Publications), 339
Borchgrevink, E., expedition to the Antarctic under, 205, 525
Borneo, New Publications—
Die Niederlandische Expedition nach Zentral-Borneo, von Prof. Molengraaff, 110
Schetsen uit Borneo's Westerafdeeling, door E. Kühr, 441
Bornhaupt. C. von, Die deutschen Bestrebungen an der Somali-Küste (New Publications), 113
Boro Khoro mountains, Central Asia, 657
Bororós, Algunos datos sobre los, por J. Koslowsky (New Publications), 445
Bosnia-Herzegovina, New Publications—
Meteorologischen Beobachtungen in, 438
Rambles, etc., in, by Dr. Munro, 212
Wasserbauten in, von P. Balliff, 438
Boston Basin, South-western part of the, by J. L. Tilton (New Publications), 334
Botany, Department of, Guide to the British Mycetozoa, by A. Lister (New Publications), 448
Böttego, Capt, progress of expedition to Somaliland, 99, 553
————————, review of book, 274
Bottle-Voyage in the North Atlantic, 102
Boudène au Mas Cabanis, Les cavernes de la, par F. Mazauric (New Publications), 438
Bouilhac, R., Sur la mise en culture des terres de bruyères de la Dordogne (New Publications), 107
Boundaries of British Guiana—The Evidence of Maps, by C. R. Markham, 277, 309
Boundary Treaties in Siam and Indo-China, 297
Boussinesq, J., Lois de l'extinction d'une houle simple en haute mer (New Publications), 118
Bøving-Petersen, J. O., En Bestigning af Brasiliens højeste Bjærg (New Publications), 115
————————, Et Besøg i Centralbrasiliens Knoylehuler (New Publications), 565
Bow River Valley, Canadian Rockies, 50, 56
Brabner, J. H., Gazetteer by, Note on, 417
————, The Comprehensive Gazetteer of England and Wales (New Publications), 110
Bradyseisms, movements of the Earth's crust, 230
Brandstetter, Dr., Malaio-Polynesische Forschungen (New Publications), 222
Brazil, Pedro II. of, Memoria de (New Publications), 684
Brazil, New Publications—
Brazilian Argentine Boundary, 565
Commission d'Exploration du Plateau Central du Brésil, Rapport, par L. Cruls, 115
En Bestigning af Brasiliens højeste Bjærg, by Bøving-Petersen, 115
Et Besøg i Centralbrasiliens Knoylehuler, etc., by J. O. Bøving-Petersen, 565
Voyage de M. Desvernine au Brésil, 445
Brehm, A. E., From North Pole to Equator (New Publications), 686
Brenner, Baron von, The Land of the Bataks, Review of, 75

Bretschneider, E., map of China and Surrounding Regions (New Maps), 687
Brigham, A. P., Composite Origin of Topographic Forms (New Publications), 220
Brincker, P. H., Zur Namenkunde von Deutsch-Süd-Westafrika (New Publications), 332
Brion, M. E, Les Colonies italiennes (New Publications), 214
British Association, Ipswich, 1895, Report of the (New Publications), 340
British Central Africa: *see* Africa
British Columbia and Quebec, New Maps—Indexed Pocket Map, etc., Rand, McNally & Co.'s, 451
British Columbia, New Publications—
Annual Report, Geological Survey of Canada, by G. M. Dawson, 679
Report on Mining Operations in, for 1894..564
British Columbia, New Maps—
Map of, by Hon. G. B. Martin, 342
Sprachenkarte von Britisch-Columbien, von Fr. Boaz, 342
British Empire, New Publications—
Growth of British Empire, 570
British Guiana—
and Venezuelan Boundary Frontier, Mr. Dixon's note on, 99
Boundaries of, The Evidence of Maps, by C. R. Markham, 277, 309
British Title to, Mr. Markham's Note on, 100
Note to Sketch-Map of the Upper Kuyuni in, by Lieut. Godfrey-Faussett, 541
British Guiana, New Maps—
Special Map of, by G. Philip and Son, 342
Stanford's Map of Guiana and Venezuela, 342
British Guiana, New Publications—
British Guiana; a Sketch, by Sir D. Chalmers, 565
Documents . . . on Boundary between Venezuela and, 445
Grenze von Britisch-Guayana, von H. Wichmann, 445
Question of British Guiana Boundary, 565
Reports on Conglomerate Prospection Expedition, by Messrs. Anderson and Dunn, 445
Seamy side of, by Fr. Comyn, 445
Venezuela and British Guiana Boundary, by Dr. H. R. Mill, 217
British India, From Yun-Nan to, by Prince Henry of Orleans, 300
British Islands, Proposed Geographical Description of the, etc., by Dr. H. R Mill, 345 *et seq.*
British Mycetozoa, Guide to the, by A. Lister (New Publications), 448
British New Guinea, by Sir W. Macgregor (New Publications), 116
Broeker, D., Die Faeroer-Gruppe (New Publications), 107
Brower, J. V., Prehistoric Man at . . . Mississippi R. (New Publications), 565
Brown, H. Y. L., Report on Geological Explorations in South Australia, 554
Brown, —, South Australia, Government Geologist's Report (New Publications), 336
Browne, C. R., Ethnography of county Mayo (New Publications), 328
Bruce, W S., Cruise of the *Balæna* and *Active* in Antarctic Seas, 502 *et seq.*
Brunias, Alex., Les imitateurs de, par M. Hamy (New Publications), 569
Buchan, Dr. A., Specific Gravities, etc. (New Publications), 683
Buchanan, J. Y., The Guinea and Equatorial Currents, 267
Budapest, New Publications—
Resultate der Volksbeschreibungs und Volkszählung, von J. Körösi und Dr. Thirring, 108
Budge, E. Wallis, Life and Exploits of Alexander the Great (New Publications), 449
Buenos Ayres, New Publications—
Memoria . . . por Dr. E. Frers, 334
Nota sobre la industria, etc., by Dr. Lahille, 444
Bugonia-Lore of the Ancients, by C. R. Osten Sacken (New Publications), 224
Bureau, Ed., La flore de Madagascar (New Publications), 443
Burma, New Publications—
Der Ausstatz in Birma, 677
Burma-Karenni Railway, 601
Burton, Lady, death of, 559
Byström, H., Sverige i utländska Kartverk (New Publications), 561

C.

Cabot, John, voyage to America, Centenary of, 675
Cabots, Voyages of the, in 1497 and 1498, by S. E. Dawson (New Publications), 114
Cadell, H. M., Geology and Scenery of Sutherland (New Publications), 561
Caillaud, M. du, on Friar Odoric's Island of Dondin, 659
Calcul rigoureux du point à la mer, etc., par M. J. Ripol (New Publications), 337
California, New Publications—
Changes in Flora and Fauna of, H. H. Behr, 679
Mount Goddard and its Vicinity, by T. S. Solomons, 444
Calvert, A F, Map of Western Australia, showing goldfields (New Maps), 573
———, Western Australia; its History and Progress (New Publications), 566

Calvo, J. B., Republic of Costa Rica (New Publications), 681
Cameroons frontier, 552
——— Peak, Miss Kingsley's ascent of, 96
Cameroons, New Publications—
Begleitworte zu den Karten "Reiseroute der Expedition des deutschen Kamerunkomitees," von Dr. M. Limpricht, 114
Om Kamerunomradet, af P. Dusén, 443
Canada, Geological Survey of, Geographical work of the, in 1895, by Dr. Dawson, 412
———, Mr. O'Sullivan's explorations in, 315
Canada, New Publications—
Canada, by Earl of Derby, 114
Forests of Canada, by J. Macoun, 114
Geological Survey, Annual Report, 414
———————, List of Publications, 333
Lecture on New British Route to Pacific, by Colonel J. Harris, 564
Report of Geological Survey Department, 1895. 679
Report on Mining Section in Alberni District, by W. J. Sutton, 564
Statistical Year Book for 1894..353
Tides and Currents in Canadian Waters, by W. B. Dawson, 679
Canadian Rocky Mountains, Lake Louise in the, by W. D. Wilcox, 49 *et seq.*
Canary Islands, New Publications—
Der Insel Tenerife und ihre Bewohner, von Dr. Meyer, 113
Les Anversois aux Canaries, par M. Donnet, 112
Canterbury and Westland, Notes on the Meteorology of, by J. T. Meeson (New Publications), 116
Cape Cod Canal, United States, 553
Cape Horn, The Gold Diggings of, by J. R. Spears (New Publications), 335
Cape Subregion of the Geography of Mammals, 291
Capitaine, Les, par L. Drapeyron (New Publications), 684
Cappelle, Dr. H., Bijdrage tot de Kennis van het Gemeng de Diluvium (New Publications), 683
Cardioid Earth, The, by W. L. Jordan (New Publications), 224
Carlheim-Gyllenskold, V., Determinations des eléments magnétiques (New Publications), 328
Carlson, E., Columbus and Toscanelli, eller frågan . . . Indien (New Publications), 568
Carmen, Beni river, 188, 189
Carnivora of the Ethiopian Region, 285, 288
Carnivora, New Publications—
Geographische Verbreitung der jetzt lebenden Raubthiere, von C. Grevé, 448
Carolina, New Publications—
Cuspate Capes of the Carolina Coast, by C. Abbe, 334
Carpathians, New Publications—
Jahrbuch des Ungarischen Karpathen-Vereines, 561
Carrock Fell, 611
Cartier's Course—a Last Word, by the Right Rev. M. F. Howley (New Publications), 114
Cartographique, L'Année, par F. Schrader (New Maps), 342
Case, E. C., Experiments in Ice Motion (New Publications), 338
Castilho, A. de, A provincia de S. Thomé (New Publications), 443
Caucasia, Ethnography of, 547
Caucasian travels of Dr. Abich, Mr. Freshfield's remarks on, 656
Caucasus, New Maps—
Karte des nordöstlichen Kaukasus, von Dr. Radde, 225
Caucasus, New Publications—
Géologie . . . du Caucase central, par M. Fournier, 327
Reise nach Süd Kaukasien, von Prof. Arzruni, 327
Caustier, E., and others, Ce qu'il faut connaître de Madagascar (New Publications), 113
Celebes, F. and P. Sarasin's explorations in, 205
Celebes, New Publications—
Besuch auf Buton and Süd-Celebes, von Dr. G. Radde, 563
Reiseberichte aus Celebes, von P. und F. Sarasin, 212, 678
Cerro Viejo and its Volcanic Cones, by J. Crawford (New Publications), 334
Ceylon Branch of the Royal Asiatic Society, Catalogue of Library of (New Publications), 570
Ceylon, New Publications—
Eine Woche in Ceylon, von Dr. G. Radde, 562
Chaco Indians of the Pilcomayo, 83
Chaffanjon, M., journey in Mongolia and Manchuria, 550
Chah-Beg, Persia, 172
Chaigneau, J. F., Instrucciones Nauticas de la Costa de Chile (New Publications), 115
Chaix, Prof. E., Les côtes des Iles Normandes de la Manche (New Publications), 438
Chaix, P., Le Général Sir Henry Rawlinson (New Publications), 119
Challenger Medal presented by Dr. John Murray, 206
Chalmers, Sir D., British Guiana (New Publications), 565
Chalmers, Mr. R., explorations south of the St. Lawrence, 413
———————, Pleistocene Marine Shore-lines on South Side of St. Lawrence Valley (New Publications), 679

Chamberlain, B. H, Essay in aid of a Grammar and Dictionary of the Luchuan Language (New Publications), 441
Chambers, H. E., Constitutional History of Hawaii (New Publications), 446
Chandless, the late W., legacy from, 655
Channel Islands, New Publications—
Les côtes des Iles Normandes de la Manche, par M. E. Chaix, 438
Channing, E., The United States of America, 1765–1865 (New Publications), 679
Chao Ju-Kua, by F. Hirth (New Publications), 339
Chapman, Gen., on the mapping of Africa, 414, 550
Charemaru Peak, Tibet, 467
Charts, New Maps—
Admiralty, 122, 343, 575
Cancelled, 123, 344, 575
Corrected, 124, 345, 576
United States Hydrographic, 124, 228, 452
Chauvigné, A., Géographie, etc, de la Champagne (New Publications), 327
Chavannes, E., Les résultats de la guerre entre la Chine et le Japan (New Publications), 329
Chechikweyo's town, 184
Cheesewright, F. H, the Mexican Drainage Canal (New Publications), 444
Chengtu-fu plain, Western China, 201
Cherchen, town and river, Tibet, 458, 460
Chernyshev, M., expedition to Novaya Zemlya, 206, 425
Cherso, New Publications—
Cherso, Isola nel Quarnero, by Prof. Czink, 560
Chervin, Dr., La situation démographique de la France en Europe (New Publications), 327
Chesapeake-Albemarle Canal, 554
Cheviot, M., Exploration du Gouffre de Pierrefeu (New Publications), 438
Chewings, Dr. C., Notes on Coolgardie Gold Fields (New Publications), 682
Chijs, J., van der, Nederlandsch-Indisch Plakaatboek (New Publications), 562
————————, Dagh-Register gehouden in Casteel Batavia (New Publications), 562
Childers, Right Hon. H., Obituary of, 324
Chile, Drs. Steffen and Krüger's explorations in, 101
Chile, New Maps—
Hydrographic Charts, 452
Chile, New Publications—
Anuario hidrografico de la Marina de Chile, 335
Bemerkungen . . . Verschiedenheit zwischen Patagonien und Chile, von Dr. R. A. Philippi, 680
Bibliografía Marítima Chilena, por N. Anrique, 445
Chile und die Deutschen Colonien, von H. Kunz, 565
Die Thermen von Chillan in Chile, von Dr. Reiche, 335
Chile, New Publications—*continued.*
Instrucciones Nauticas de la Costa de Chile, par J. F. Chaigneau, 115
Chile and Argentine, New Publications—
Boundary Questions of, by Arana, Valderrama, Steffen and Montaner, 217
China and Tongking boundary, 299
—— system of Japanese Alps, 126
——, Western, Mr. A. von Rosthorn's Journey in, 201
China, New Maps—
China and Surrounding Regions, by E. Bretschneider, 687
China, New Publications—
Der zukünftige Handel Chinas, von Dr. Markoff, 440
Imperial Maritime Customs, Trade Reports, 110
2500 kilometer opover Yangtse Kiang af W. Coucheron-Aamot, 111
Mesny's Chinese Miscellany, 111
Treaty Series, Convention between Great Britain and China, etc., relative to Burmah and Tibet, 111
China and France, New Publications—
Délimitation et de commerce . . . entre la France et la Chine, 440
China and Japan, New Publications—
Résultats de la guerre entre la Chine et le Japon, par M. Chavannes, 329
Chinchona, New Publications—
Étude des arbres à quinquina, par Dr. Verrier, 219
Chin-chuan district, Western China, 201
Chinese monetary system, 456
Chinoises, Histoire des Études, par H. Cordier (New Publications), 338
Chiromo to Blantyre, railway from, 384
Chisholm, G. G., Cuinet's 'Turkey in Asia'—Review, 281
————————, 'Gazetteer of the World,' Note on, 416
————————, Remarks on "Proposed Geographical Description of the British Islands," 363
————————, Review of Colonial Systems and Colonizing Peoples, by M. Dubois, 193
Chitral, New Publications—
New Dangers and Fresh Wrongs, by Dr. Leitner, 111
Relief of, by Captains G. J. and F. E. Younghusband, 212
Chittenden, H. M., Yellowstone National Park (New Publications), 680
Chiuta Lake, A visit to, in British Central Africa, by Robert Codrington, 183
Choffat, P., Promenade aus Gerez (New Publications), 439
Chokaisan volcano, Japan, 148
Christie, R. B., Lieut Sparrow, and Major Mainwaring, Sketch of the Routes in Somaliland (New Maps) 121
Church Missionary Society, Proceedings of the (New Publications), 223
Clarence Island, Antarctic, 516, 642

Clermont-Ganneau, C., Archæological Researches in Palestine, 1873–74 (New Publications), 678
Climate, New Publications—
Klimate der Erde, etc., von Prof. W. J. van Bebber, 568
"Cloud-bursts" in Lakeland, 620
Clozel, M., au Congo (New Publications), 214
————, journey in French Congo region, 553
Coasts, morphology of, 318
Cochin, New Publications—
Report on Census of, 1891, by C. A. Menon, 329
Cocoa, New Publications—
History and Cultivation of cocoa tree, by "Historicus" [Cadbury], 571
Codrington, R., A visit to Lake Chiuta, British Central Africa, 183
Coffee-planting of the Shiré Highlands, 374, 385
Coghlan, T. A., Wealth and Progress of New South Wales (New Publications), 446
Cole, G. A. J., Open-Air Studies (New Publications), 567
Collie, D. K., Report on Governmental Maps for Schools (New Publications), 223
Collie, Dr. J. N., Climbing on the Nanga Parbat Range (New Publications), 441
Collignon, Dr., De l'Auvergne à l'Atlantique (New Publications), 327
Collingridge, G., The Discovery of Australia (New Publications), 446
Colomb, Vice-Admiral, The Manœuvring Powers of Steamships, etc. (New Publications), 340
Colombaroli, A., Sandeh vulgairement appelée Niam Niam (New Publications), 333
Colombia, New Publications—
Bureau of American Republics. Bulletin of, 681
Colonial Systems and Colonizing Peoples, M. Dubois on, Review by G. G. Chisholm, 193
Colorado Plateau, New Publications—
Ueber das Colorado-Plateau zum Grand Cañon, von Dr. Credner, 216
Colquhoun, A., on the Nicaragua Canal, 316
————, Lecture on Nicaragua and its Canal (New Publications), 335
————, The Key of the Pacific, the Nicaragua Canal (New Publications), 217
Columbretes, by H. I. H. Archduke Ludwig Salvator (New Publications), 108
Columbus, New Publications—
Authentic Letters of Columbus, by W. E. Curtis, 339
Columbus and Toscanelli, New Publications—
Eller frågan om prioriteten af idén . . . Indien, af E. Carlson, 568
Colvin, Sir A., Indian Frontiers and Indian Finance (New Publications), 111
Commerce and Deep Waterways, by Prof. L. M. Lewis (New Publications), 570
Commerce, Highways of, Trade Routes of Foreign Countries (New Publications), 570
Commerce in War, The Protection of our, by H. W. Wilson (New Publications), 340
Comoros Islands, fauna of, 284
Comyn, F., The Seamy Side of British Guiana (New Publications), 445
Cones, E., Expeditions of Z. M. Pike to Headwaters of the Mississippi, etc. (New Publications), 444
Confucius, Tomb of, In a Mule Litter to the, by A. Armstrong (New Publications), 440
Congo, French, geographical work in, 552
———, Miss Kingsley's travels in the, 95
——— Railway, progress of the, 553
——— State, districts of the, 203
————, explorations by officials of the, 203
Congo, New Maps—
Congo Français, par Hansen, 228
Carte . . . du Chemin de Fer du Congo, par A. J. Wauters, 342
Congo, New Publications—
Animaux domestiques au Congo, par E. Meuleman, 442
Bibliographie du Congo, 1880–95, par A. J. Wauters, 213
Climatologie du Congo, par Dr. A. Poskin, 332
Deux années . . . chez le sultan Rafaï, par Ch. de la Kéthulle, 331
Erforschung des Kongo-Systems, von Dr. Pahde, 113
Le Chemin de Fer du Congo, 563
Les districts de l'État, 213
M. Clozel au Congo, 214
Conradt, L., Das Hinterland der deutschen Kolonie Togo (New Publications), 443
Conrau, G., Ueber das Gebiet zwischen Mundame und Baliburg (New Publications), 332
Continental areas, evolution of, 231
Continents, New Publications—
Areal und mittlere Erhebung der Landflächen, von H. Wagner, 218
Conway, Sir Martin, proposed expedition to Spitzbergen, 555
————————, Remarks on "First Crossing of the Southern Alps of New Zealand," 501
Cook, Capt., earliest monument to, 435
————, and his first voyage, etc., by Sir H. W. Norman (New Publications), 336
Cook, Mount, New Zealand, 486, 500
Cook, O. T., Third Report of New York State Colonization Society, 563
Coolgardie Gold Fields, Notes on the, by Dr. Chewings (New Publications), 682

Coolgardie Gold Fields, Map by A. J. Vogan (New Maps), 688
Cope, E. D., The Formulation of the Natural Sciences (New Publications), 685
Copernicus, New Publications—
Les découvertes geographiques de son temps, par M. A. Daubrée, 569
Copland river and valley, New Zealand, 489, 500
Copland-Crawford, Major, journey from the Niger Delta to the Benin river. 661
Coquilhat, Capt., monument to, 557
Corbett, Mr., and Lieut. Drummond, Photographs of Spitzbergen, 576
Corcelle, M., Grottes du Jura méridional (New Publications), 438
Cordier, H., Fragments d'une Histoire des Études Chinoises (New Publications), 338
———, In Memoriam: Charles Ploix (New Publications), 223
———, Notice sur H. C. Rawlinson (New Publications), 119
Coret, M., Sur un appareil hydraulique . . . de rotation de la Terre (New Publications), 219
Cornoide, La, by A. Sanchez (New Publications), 567
Cornu, A., Phénomènes . . . de l'atmosphere (New Publications), 568
Coronet, M. J., on Congo Railway works, 553
Corthell, E. L., The Tehuantepec Ship Railway (New Publications), 444
Cosa, Juan de la, Mapa-Mundi, por el Conde las Navas (New Publications), 683
Cosmogonique, Nouvelle théorie, par M. Duponchel (New Publications), 220
Costa Rica, New Publications—
Republic of, by J. B. Calvo, 681
Cotton-tail, Geographical distribution of the, etc., by O. Bangs (New Publications), 334
Coucherou-Aanot, W., 2500 kilometer opover Yangtse Kiang (New Publications), 111
Cowan, M. D, von A. Miessler (New Publications), 339
Cowper, H. S., Notes on a Journey in Tarhuna and Gharian, Tripoli, 150 *et seq.*
Crawford, J., Cerro Viejo and its Volcanic Cones (New Publications), 334
Credner, Prof., on the Evolution of the Baltic, 425
———, Ueber das Colorado-Plateau zum Grand Cañon (New Publications), 216
———, Ueber die Entstehung der Ostsee (New Publications), 220
Crevaux, Dr. Jules, expedition on the Pilcomayo, 83
Croglin Gorge, Lakeland, 610
Crowley's Ridge, Geographic Development of, by C. F. Marbut (New Publications). 333
Cruls, L., Commission d'Exploration du Plateau Central du Brésil (New Publications), 115
Crummock and Buttermere, origin of, 618
Cryptobronchus japonicus, 137
Cuinet's 'Turkey in Asia,' Review by G. G. Chrisholm, 281
Cundall, Fr., Jamaica in the Past and Present (New Publications), 335
Cunningham, G. C., A Scheme for Imperial Federation (New Publications), 223
Cunningham, D., The Estuary of the Tay (New Publications), 110
Currents, The Guinea and Equatorial, by J. Y. Buchanan, 267; *see also* 568
Currents, New Publications—
Courants . . . dans l'Atlantique nord, par M. Hautreux, 221, 568
Currents in the Red Sea, by Capt. Hood, 221
Guinea and Equatorial Currents, by J. Y. Buchanan, 568; *see also* 267
Les vents et les courants de la Mer, par Gén. Matthiesen, 220
Curtis, W. E., Authentic Letters of Columbus (New Publications), 339
———, Venezuela: her Government, etc. (New Publications). 445
Curzon, G. N., letter from, on the etymology of Makran, 557
Cushing, Dr., on the Sis Salwin States, 590
Cvijić, Dr., La grande grotte de Douboca (New Publications), 439
Cyrenaica, New Publications—
La Pentapole cyrénéene et la colonisation, par M. A. Rainaud, 113
Czink, Prof. Cherso, Isola nel Quarnero (New Publications). 560
Czirbusz, Prof. G., Das Jara-Thal und seine Bewohner (New Publications), 561

D.

D'Abreu, A., Discovery of the Moluccas, 365
Dadelszen, E. J. von, New Zealand Official Year-Book for 1895 (New Publications), 336
Daghestan, New Publications—
Der Nordfuss des Dagestan, von Dr. Radde und E. Koenig, 327
Dagomba territory, Niger Basin, 97
Dahomey et le Niger moyen au Sahara français, par le, by Captain Toutée (New Publications), 442
Dahomey, New Publications—
Dahome, land och folk, af A. H. de Pomian, 563
Dakar au Cap Juby (New Publications), 443
Dakar, Senegal, 314

D'Albaigne, F. et A., par Dr. Hamy (New Publications), 222
Dalgleish, Dr. W. S., Ashanti and the Gold Coast (New Publications), 215
Dall, W. H., "Jeannette Relics" (New Publications), 566
————, Alaska as it was and is, 1865–95 (New Publications), 333
D'Almeida, P. C., Gogol géographe (New Publications), 223
D'Almeida, M., La colonisation russe contemporaine le long de la Volga (New Publications), 109
Daly, C. P., Controversy between Venezuela and Great Britain (New Publications), 566
Damascus and Bagdad, New Maps—
Routenkarte einer Reise von Damaskus nach Bardād, von Freiherr v. Oppenheim, 687
Damascus to Bagdad, Freiherr v. Oppenheim's journey from, 548, 658
Damköhler, E., Zur Sprachgrenze um Aschersleben (New Publications), 107
Dana, J. D., by H. S. Williams (New Publications), 222
Danger Islands, Antarctic, 627
Danube, The Ship Canal at the Iron Gates on the, 544
Danube, New Publications—
Die Donau als Völkerweg, von A. v. Schweiger-Lerchenfeld, 327
Donau-Studien, von Dr. J. v. Lorenz-Liburnau, 438
Felsen-Inschriften der Katarakte in der untern Donau, von M. Téglás, 107
D'Anville's boundaries in Guiana, 279
Darab, Persia, 26
Darfur, Borders of, MM. Nilis and de la Kéthulle's journeys on, 428
Daria-i-Nimak, Persia, 164, 166
Darkot pass, Hindu Kush, 91
Dasgirdun, height of, 166
Dasgirdun, Persia, 40
Dasht-i-Kavir, 34, 36, 165, 166
D'Attanoux, J. B., Tripoli et les voies commerciales du Soudan (New Publications), 553
Däubler, Dr., Acclimatisation und Physiologie der Tropenbewohner (New Publications), 339
Daun, Wadi, Tripoli, 156
Davey, R., Stamboul: Old and New (New Publications), 440
D'Avila, C., Dos nivelamentos de precisão e da sua superficie de referencia (New Publications), 117
Davis, Prof. W. M., on Local Maps in American Schools, 665
————, Letter from, on Theoretical Geography, 557
————, Quarries in the Lava Beds at Meriden (New Publications), 334
Dawson, Dr. G. M., Geographical Work of the Geological Survey of Canada in 1895..412
Dawson, Dr. G. M., Annual Report, Geological Survey of Canada (New Publications), 679
Dawson, W. B., Tides and Currents in Canadian Waters (New Publications), 679
Debo, Lake, Upper Niger, 98
Déboisement des montagnes, Des effets du, par M. Guénot (New Publications), 117
Deckert, Dr., Account of Projected Ship Canals in the United States, 553
———— —, Amerika, Eine allgemeine Landeskunde (New Publications), 215
————, Betrachtungen über Westindien (New Publications), 335
————, Ueber den stand der geo- [illegible] -Amerika
Décimal, Le temps, par M. de Rey-Pailhade (New Publications), 117
Deh Balla valley, Persia, 30
Dehérain et Demoussy, MM., Sur la circulation de l'air dans le sol (New Publications), 448
Delannoy, Ch., L'Angola et la colonisation portugaise (New Publications), 678
De Launay, M., L'île de Lemnos (New Publications), 109
Delaware-Chesapeake Canal, 554
Delaware river, New Publications—
Does the Delaware Water Gap consist of Two River Gorges? by E. Walter, 216
Delisle, Dr. F., La colonisation à Madagascar (New Publications), 679
De Magistris, L., Sul clima della Colonia Eritrea (New Publications), 214
Demanche, G., La France recule au Niger (New Publications), 333
D'Enjoy, P., Une incursion chez les Moï (New Publications), 111
D'Entrecasteaux, New Publications—
Collection de Dessins provenant de l'Expédition de, par Dr. E. T. Hamy, 568
Der, town of Syria, 549
Derby, Earl of, Canada (New Publications), 114
Descamps, Commandant, Au lac Moëro (New Publications), 213
Deserts, New Publications—
Dépressions et déserts, par A. de Lapparent, 117
Deserts, salt, of Persia, altitudes and climate of, 165–167
Devinka river, New Guinea, 432
Dezert, M. du, Mission en Espagne (New Publications), 328
Diagram for Determining the Parallaxes in Declination, etc., by Major S. Grant, 649
Diamanti, M., Le Transvaal, État politique, etc. (New Publications), 113
Diatom ooze of the Great Southern Ocean, 539
Dickinson, B. B., Geography as a School-subject (New Publications), 571

Dickson, H. N., The Movements of the Surface Waters of the North Sea, 255 *et seq.*
Diener, Dr, Die Eiszeit in Himalaya (New Publications), 441
———, Mittheilungen über eine Reise im Central-Himalaya von Kumaon, etc. (New Publications), 111
Diest und Anton, Neue Forschungen im nordwestlichen Kleinasien (New Publications), 329
———, Itinerar-Aufnahmen im nordwestlichen Kleinasien (New Maps), 226
Diller, J. S., Tertiary Revolution in the Topography of the Pacific Coast (New Publications), 216
Dinklage, L., Stromversetzungen vor der Bucht von Biscaya (New Publications), 326
Diurnal waves, origin of, 239
Dixon, G. G., note on the British Guiana and Venezuelan Boundary Frontier, 99
Doberck, Dr., How to manage ship in a typhoon (New Publications), 567
Dodd, J., Formosa (New Publications), 111
Doering, Premierlieutenant v., Reiseberichte von (New Publications), 332
Doga, Wadi, Tripoli, 151, 152
Domestication of Animals, by Ed. Hahn (New Publications), 338
Don, Dr. W. G., Archæological Notes on Early Scotland (New Publications), 561
Donald, C. W., The Cruise of the *Balæna* and *Active* in the Antarctic Seas, 625 *et seq*
Donat, F. von, The Pontine Marshes (New Publications), 439
Dondin Island of Friar Odoric, identification of, 659
Dongola Expedition, Map to illustrate the, by W. and A. K. Johnston (New Maps), 573
Donnet, M, Les Anversois aux Canaries (New Publications), 112
Dordogne, New Publications—
Sur la mise en culture des terres de bruyères de la Dordogne, par M. Bouilhac, 107
Dortsman, Adriaan, Documenten betreffende de ontdekkingstochten van (New Publications), 683
Donboca, La grande grotte de, par Dr. Cvijić (New Publications), 439
Dowding, Capt, Map showing Surveys, etc., from Quito down the Rio Napo (New Maps), 121
Dozy, R., Vesperas do Centenario (New Publications), 439
Drake, Sir Francis (New Publications), 339
Drapeyron, L., Les Capitaine, gardiens du dépôt . . de Cassini (New Publications), 684
Dravidian races in Makran, 389, 390
Drift-dams in Lakeland, 619
Drygalski, Dr. E. v., Der gegenwärtige Standpunkt der Polarforschung (New Publications), 337
Dubois, M., on Colonial Systems and Colonizing Peoples, review by G. G. Chisholm, 193
Duffart, Ch., Les anciennes baies de la Gascogne (New Publications), 560
Du Fief, J., La zone polaire australe, etc. (New Publications), 682
Dufour, M. H., La recoloration des Alpes après le coucher du soleil (New Publications), 219
Dumble, E. T., The Soils of Texas (New Publications), 334
Dundee Island, Antarctic, 633, 635
Du Pasquier and Penck, Alter und die Verbreitung des Lösses (New Publications), 683
Duponchel, M, Nouvelle théorie Cosmogonique (New Publications), 220
———, La circulation des vents et de la pluie (New Publications), 118
Duro, D. C. F., Relación breve . . . viaje que hizo A. de Mendaña (New Publications), 680
Dusén, P., Om Kamerunområdet (New Publications), 443
Dutch boundary in Guiana, 278, 279
Dutch in Batak Land, The, 80, 81
Dutch East Indies, New Publications—
Dagh-Register . . Nederlandts-India, van J. A. van der Chijs, 562
Nederlandsche - Indisch Plakaatboek, door J. A. van der Chijs, 212, 562
Dutreuil de Rhins and Grenard, MM., Mission . . . dans la Haute-Asie (New Publications), 329
Dyak (Dayak), The Name of, Mr Ling Roth on the origin of, 432

E.

Eamont river, Lakeland, 615
Earth's Crust, Movements of the, by John Milne, 229 *et seq.*
Earthquakes, origin of, 235
Earthquakes, New Publications—
Internationalen Systems von Erdbeben-Stationen, von E. Rebeur-Paschwitz, 220
Ueber submarine Erdbeben, von E. Rudolph, 220
Earth-tremors, observations on, 244
Easter island, New Publications—
Die Zustände auf der Oster-Insel, von Dr. Polakowsky, 217
Ecuador, New Maps—
Map showing Captain Dowding's Surveys, etc., 121
Ecuador, New Publications—
Bureau of American Republics, Bulletin of, 681
Eden river-valley, 605
Edenside waterways, 607

Edrisi's account of Kais, 647
Educational Lectures by Mr. Mackinder, 91
Educational Prizes of the R.G.S., award of, 425, 544
Egli, J. J., Die Seele der geographische Namen (New Publications), 684
Egypt, New Publications—
Aegypten 1894, von A. von Fircks, 113
The Egypt of the Hebrews and Herodotus, by Rev. A. H. Sayce, 213
Egyptian, New Publications—
Die Wiedergeburt Aegyptens, etc., von Dr. Schweinfurth, 221
Ehlers, Otto E., Bangkok (New Publications), 678
Ehlers, Otto, death of, 102
———————, last expedition in New Guinea, 431
———————, Biography of, W. Wolkenhauer (New Publications), 569
Ehrenberg, C. G., by Dr. Günther (New Publications), 222
Eide, Færoes, 20
Eisen, G., Explorations in Cape Region of Baja California (New Publications), 679
Ekholm, N., Om väderteksförhallandena . . . luftballong(New Publications), 567
Elastic Spheroid, Rotation of an, by S. S. Hough (New Publications), 683
Eldridge, G. H., A Geological Reconnaissance in North-West Wyoming (New Publications), 216
Eldslandet, by O. Nordenskjöld (New Publications), 445
Elephant hunting in Central Africa, 374
Elliot, G. F. Scott-, A Naturalist in Mid-Africa (New Publications), 331
———————, Africa as a Field for Colonial Enterprise (New Publications), 112
———————, Commercial Prospects of British Central and East Africa (New Publications), 678
Elliot, Mr. Scott-, Book on Mid-Africa, Note on, 669
Elsdale, Lieut.-Colonel, The Problem of the Races in Africa (New Publications), 678
England and France in the Nile Valley, by Capt. F. D. Lugard (New Publications), 214
England, New Publications—
The lost possessions of, by W. F. Lord, 685
England and Wales, New Maps—
Geological Survey of, 341
Ordnance Surveys, 129, 225, 341, 449, 572, 686
Relief Map of, Longmans & Co., 342
England and Wales, New Publications—
Comprehensive Gazetteer of, by J. H. Brabner, 110
England's History as Pictured by Famous Painters, by A. G. Temple (New Publications), 677
English Lakeland, The Waterways of, by J. E. Marr, 602 *et seq.*
English and German Dictionary, by Flügel, Schmidt, Tanger (New Publications), 571
English colonization, 194
English Topography, The Gentleman's Magazine Library, edited by F. A. Milne (New Publications), 110
Ennerdale Lake, 618
Equatorial and Guinea Currents, by J. Y. Buchanan, 267
Erbach-Erbach, Graf, Im Delta des Orinoko (New Publications), 566
Erde, Die, von Dr. F. Heiderich (New Publications), 684
Erdkruste, den Bau der, von A. Philippson (New Publications), 220
Erdmagnetismus und Erdgestalt, von Dr. A. Schmidt (New Publications), 338
Erfurt, New Publications—
Die Lagenverhältnisse von, von Dr. Kirchhoff, 107
Erg Region, M. Foureau's journey in the, 663
Erie and Ontario, New Publications—
Lakes Erie and Ontario, etc., Sailing Directions for, 680
Eritrea, New Maps—
Nuova Carta . . . nell' Eritrea e Regioni Limitrofe, 450
Eritrea, New Publications—
Sul clima della Colonia Eritrea, di L. de Magistris, 214
Les Colonies italiennes, par M. Brion, 214
Eskdale, stream diversions near, 619
Essequibo, New Publications—
Old Boundary of Essequibo, by J. Rodway, 565
Ethiopian Region of the Geography of Mammals, 282
———————, boundaries, 283; mammal fauna of, 284; rodents, 285; antelopes, 285; carnivora, 285; insectivora, 286; subdivision, 286; past history of, 294
Ethnography of Caucasia, 547
Ethnology, by A. H. Keane (New Publications), 338; note on, 433
Etsch, Die, von A. Penck (New Publications), 109
Europe, New Publications—
Fågan om istidens . . . Europa, by A. G. Nathorst, 560
Sur le régime pluviométrique de l'Europe occidentale, par M. Angot, 110
European settlement in Central Africa, 378–380
Euting, Prof. Dr. J., von A. Miessler (New Publications), 569
Evaporation of the soil, 242, 243
Ewing, Rev. W., A Journey in the Hauran (New Publications), 213
Expérimentale à l'histoire orogenique de l'Europe, Essai d'application de la methode, par S. Meunier (New Publications), 117

F.

Færoes, the, by Dr. K. Grossmann, 1 *et seq.*
———, general position and geological structure of, 2, 22; cliff scenery, 4; glacial action, 5; climate, 6; dress of the natives, 8; bird-catching, 19; literature, 21; volcanic history, 23
Færoes, New Publications—
Færoerne, 1600-1709, af N. Andersen, 327
Die Faeroer-Gruppe, von D. Broeker, 107
Fagalde, A., El Puerto de Talcahuano i sus obras de mejoramiento (New Publications), 115
Fahalfahra, ancient town of, 672
Fahraj, ancient town of, 670, 672, 674
Faquibine Lake, Upper Niger, 99
Far East, Problems of the, by Hon. G. Curzon (New Publications), 440
Farquharson, Col. J., Remarks on "Proposed Geographical Description of the British Islands," 357
Fassig, O. L., Report of International Meteorological Congress edited by (New Publications), 220
Fathura, sulphur springs at, 25
Faucilles, Les, par Dr. A. Fournier (New Publications), 327
Fault valleys of Lakeland, 611
Feilden, Col., Kolguev Island (New Publications), 439
Fergusson Island, Sir W. MacGregor's journey across, 432
Fernando Po Island, fauna of, 283
Fest, Prof. A., Roads from Hungary to Adriatic (New Publications), 561
Fewkes, J. W., A Comparison of Sia and Tusayan Snake Ceremonials (New Publications), 118
Fiji Islands, New Publications—
Bidrag till, Kännedomen om Fidjiboarnes . . . af Ernst Stenberg, 682
Filhol, M., on lectures to travellers, 320
———, Conseils aux voyageurs naturalistes (New Publications), 340
Finland, geography, etc., of, 199
Finland, New Publications—
Die Kulturentwickelung Finnlands, von N. V. Köppen, 109
Finmarken, New Publications—
Folk og natur i Finmarken, af H. Reusch, 328
Finsch, Dr. O., Charakteristik der Avifauna Neu-Seelands (New Publications), 446
Fiorini, M., Sopra tre speciali projezioni meridiane, etc. (New Publications), 119
Firabuz, Makran, 397
Fircks, A. von, Aegypten, 1894 (New Publications), 113
Fiscarrald, Señor, explorations on the Madre de Dios, 189
FitzGerald Pass, New Zealand Alps, 488
FitzGerald, E. A., The First Crossing of the Southern Alps of, 483 *et seq.*
Fitz Gerald, E. A., Photographs of the Southern Alps of New Zealand (New Maps), 576
———, Work in New Zealand (New Publications), 116
FitzRoy, Admiral Sir R. O'Brien, Obituary of, 666
Flateyjarbok, Published by the Royal Danish General Staff (New Publications), 119
Floatsam and Jetsam from the Great Ocean, by Rev. J. B. Stair (New Publications), 218
Floquet et Sarranton, MM., L'heure décimale (New Publications), 447
Flügel-Schmidt-Tanger, Dictionary of English and German Languages (New Publications), 571
"Fog shaffer" in the Antarctic, 641
Fonck, F. Menendez, Travels in South America (New Publications), 681
Forel, F. A., La Commission internationale des glaciers (New Publications), 220
Forest, J., L'autruche de Barbarie (New Publications), 442
Formosa, by John Dodd (New Publications), 111
Formosa, New Publications—
Die Bevölkerung Formosa, von H. Panckow, 330
Förster, B., Ueberblick über die Niger-Expeditionen, etc., 1895 (New Publications), 114
Fort Stedman, Shan States, 580
Foulon, M., L'Islande (New Publications), 676
Foureau, M., Journey in the Erg region, 663
Fournereau, L., Le Siam Ancien, Archéologie—Epigraphie—Géographie (New Publications), 112
Fournier, M. E., Sur la géologie du Caucase central (New Publications), 327
Fournier, Dr. A., Les Faucilles (New Publications), 327
Fox Glacier, New Zealand Alps, 494, 501
France, New Publications—
La situation démographique de la France en Europe, par Dr. Chervin, 327
Francisco, Rio S., A navegacão dos affluentes do (New Publications), 115
Frankincense and Myrrh, The Land of, by J. T. Bent (New Publications), 110
Franklin, Life of Sir J., by H. D. Traill (New Publications), 569
Franz Josef Glacier, New Zealand Alps, 495
Franz Josef Land, Letter from J. von Payer on his map of, 105
Fraser, M. A., Western Australian Year-Book for 1893-94 (New Publications), 116
"Freeland" Colony, New Publications—
Colonisations project der Freiländer, von R. H. Schmitt, 571

French attempts to ascend the Mekong, 200
French claims in Siam, 298
French colonization, 194
French Congo, geographical work in, 552
French Explorations in the Timbuktu Region, 98
French Literature, New Publications—
Catalogue . . . Librairie Française, 570
French Progress in the Western Sudan, by Captain Pasfield Oliver (New Publications), 214
French West Africa: *see* Africa
Frers, Dr. E., Provincia de Buenos Aires, Memoria por (New Publications), 334
Freshfield, D. W., on the Caucasian travels of Dr. Abich, 656
Friederichsen, L., Der Sechste Internationale Geographen-Kongress in London (New Publications), 224
Fritsch, Prof. G., von A. Miessler (New Publications), 569
Fritsche, Dr., Ueber den . . . Erdmagnetischen Horizontal-intensität (New Publications), 219
Frye, A. E, Complete Geography (New Publications), 571
Fuji volcano, Japan, 149
Fulton, R. L., How Nature regulates Rains (New Publications), 683
Fuss, Müller, und Jürgens, Beobachtungen der Russischen Polarstation an der Lenamündung (New Publications), 112

G.

Gabb, W. M., Informe sobre la Exploracion de Talamanca (New Publications), 217
Gain, E., Mission scientifique en Algérie et en Tunisie (New Publications), 331
Gain, M., on the Influence of Drought on Vegetation in Algeria and Tunis, 430
Galle, Dr. A., Hohenbestimmungen im Riesengebirge (New Publications), 676
Gambia, New Publications—
La Flore utile du Bassin de la Gambie, par Dr. A. Rançon, 564
Game, Big, of South Africa (New Publications), 332
——, Wild, In haunts of, by F. V. Kirby (New Publications), 332
Gammie and Woodrow, Messrs., Records of the Botanical Survey of India (New Publications), 329
Ganeval et Groffier, MM., Dictionnaire de Géographie Commerciale (New Publications), 338
Gannett, H., Indian Territory (New Publications), 216, 444
——, Survey and Subdivision of Indian Territory (New Publications), 565
Garde, Th. V., Un été au Grœnland (New Publications), 117
Garhwal, New Publications—
Great Landslip at Gohna, in Garhwal, by J. H. Class, 677
Garing Cho lake, Tibet, 466
Garmab, Persia, 36
Garrard, J., Map of Zululand, showing positions of Gold and Coal Fields, etc. (New Maps), 121
Gascony, New Publications—
Les anciennes baies de la côte de Gascogne, by Ch. Duffart, 560
Gau-Khane, Persia, 169
Gautier, M., Au dela du Jourdin (New Publications), 112
——, Mars et la Terre (New Publications), 224
Gavazzi, Dr., Ein Beitrag zur Hydrologie der unteren Krka (New Publications), 106
Gazetteer of the Rawalpindi District (New Publications), 441
Gazetteers, Recent, Notes on, 415
Gazetteers, New Publications—
Nouveau Dictionnaire de Géographie Universelle, par L. Rousselet, 684
Ritters geographisch-statistisches Lexikon, von J. Penzler, 684
Gebauer, H., Die Waldungen des Königreichs Sachsen (New Publications), 328
Gebelin, J., Une grande industrie du Bas-Quercy (New Publications), 107
Geikie, Prof. J., remarks on rock specimens from the Antarctic, 517
Geikie, Sir A., communication on "The Færoes," 22
——, remarks on "Movements of the Earth's Crust," 247
Geistbeck, Dr. A., Die bayerische Pfalz (New Publications), 676
Gemengde Diluvium, Bijdrage tot de Kennis van het, door Dr H. van Cappelle (New Publications), 683
Gennep, J. van, Bijdrage tot de Kennis van den Kangéan-Archipel (New Publications), 441
Gentleman's Magazine Library, English Topography, by F. A. Milne (New Publications), 110
Geodesy, New Publications—
Die Norwegische Commission der Europäischen Gradmessung, 109
Jahresbericht des Direktors des Königlichen Geodatischen Instituts, 107
L'attrazione locale nella Specola geodetica, nota di V. Reina, 219
Publicationen für die Internationale Erdmessung, von Prof. E. Weiss und Dr. R. Schram, 682
Veröffentlichung des Königl. Preussischen Geodätischen Institutes, 218
Geographic Development of Crowley's Ridge, by C. F. Marbut (New Publications), 333
Geographical Association, progress of the, 664
Geographical Association, New Publications—
Catalogue of Slides, 571
Geographical Bibliographies, Recent, by Dr. H. R. Mill, 72

Geographical Congress, New Publications—
Der Sechste Internationale Geographen-Kongress in London, von L. Friederichsen, 224
Der sechste internationale geographische Congress zu London, par P. Paulitschke, 685
VI. Congresso Geografico Internazionale, by Prof. Giglioli, 340
VI. Congresso Geografico Internazionale di Londra, by Prof. Ricchieri, 341
Geographical Description, Proposed, of the British Islands, by Dr. H. R. Mill, 345 *et seq.*
Geographical Description of the British Islands, Ideas for, 348; Chief Sources of Information, 349; Plan of the Memoir, 350; Method of Execution, 352; Probable Magnitude, etc., of the Work, 354; Discussion on, 356
Geographical Exhibition, New Publications—
Geographische Ausstellung . . . in London, von H. Michow, 684
Geographical Institute, Military, in Vienna, 91
Geographical Literature of the Month—
Africa, 112, 213, 331, 442, 563, 678
America, 114, 215–217, 333, 444, 564, 679
Anthropo-Geography and History, 118, 221, 338, 568, 683
Asia, 110, 212, 329, 440, 562, 677
Australasia and Pacific Islands, 116, 217, 335, 336, 446, 566, 682
Biography, 119, 222, 339, 449, 569, 684
Europe, 106, 211, 326, 438, 560, 676
General, 119, 223, 340, 569, 684
Mathematical Geography, 117, 218, 447, 567, 682
Physical and Biological Geography, 117, 219, 338, 448, 567, 683
Polar Regions, 117, 337, 447, 566, 682
Geographical Methods, Prof. L. Neumann on, 665
Geographical Monographs, American, 319
Geographical Names, New Publications—
Die Seele der geographischen Namen, von J. J. Egli, 684
Geographical Work, The Use of Balloons in, by A. Berson, 541: *see also* 448
Geographical Work of the Geological Survey of Canada in 1895, by Dr. G. Dawson, 412
Géographie Historique, Atlas de, by F. Schrader (New Maps), 228, 574
Geographie Universelle, New Publications—
Nouveau Dictionnaire de, par L. Rousselet, 684: *see also* 415
Geographie und Höhlenkunde, von F. Kraus (New Publications), 221
Geographisches aus dem Luftballon, von A. Berson (New Publications), 448: *see also* 541
Geographisches Jahrbuch, von H. Wagner (New Publications), 340
Geography—
And Resources of British Central Africa, by A. Sharpe, 366 *et seq.*
As a Science, Dr. H. R. Mill on, 345–347
Classification of, 665
Conference of, at Chicago, Reports of the Committee, by I. C. Russell, 434
Dictionary of, by MM. V. de Saint-Martin and Rousselet, note on, 415: *see also* 684
In Secondary Schools, 208
Lectures on, by Mr. Mackinder, 91
Of Mammals, No. IV., by W. L. Sclater, 282 *et seq.*, 435
Popular University Courses in Vienna on, 91
Theoretical, letter from Prof. W. M Davis on, 557
Geography, New Publications—
Complete Geography, by A. E. Frye, 571
Conférence sur l'importance de la Géographie, etc., par Général Annenkoff, 119
Cours de Géographie, par J. Molard, 224
Der erdkundliche Unterricht, von Dr. Langenbeck, 223
Dictionnaire de Géographie Commerciale, par MM. Ganeval et Groffier, 338
Die methodischen Fragen in der Geographie, von Prof. Neumann, 340
Elementary Physical Geography, by R. S. Tarr, 118
First lessons in geography, by T. S. Steinhauer, 224
Geography as a Science in England, by Dr. H. R. Mill, 340
Geography as a School-subject, by B. B. Dickinson, 571
Geography of Mammals, by W. L. Sclater, 568
Gogol géographe, par P. d'Almeida, 223
Grundzüge der physischen Erdkunde, von Dr. Supan, 221
Le principe de la géographie générale, par M. V. de la Blache, 340
"Politischen Geographie" im Schulunterricht, von A. Kirchhoff, 223
Standpunkt der Physische Geographie, door J. Timmerman, 683
The Child's First Book of, Longmans' Geographical Series, 571
Versichten der Wirtschaftgeographie, von A. Oppel, 683
Geological Explorations in South Australia, 554
Geological Literature added to the Geological Society's Library (New Publications), 570
Geological Survey of Canada, Geographical Work of the, in 1895, by Dr. Dawson, 412
————————————, List of Publications of (New Publications), 333

Geological Survey of England and Wales (New Maps), 341
Geologische Klimate, von Dr. Woeikow (New Publications), 117
Geology of Arctic Europe and its Islands, Part I. Kolguev Island, by Col. Feilden (New Publications), 439
Geology, New Publications—
Open-Air Studies, by G. A. J Cole, 567
Georgina Basin, Stratigraphical Notes on the, etc., by R. L. Jack (New Publications), 446
Gerbing, L., Ausrottung der Raubtiere im Thuringia (New Publications), 676
Gerez, Promenade au, par P. Choffat (New Publications), 439
Germain, A., Projet d'une carte de la terre au 1 : 1,000,000 (New Publications), 117
German Africa: *see* Africa
German Barrier across Africa, The Proposed, by Dr. J. W. Gregory (New Publications), 332
German Colonies, New Maps—
Kleiner Deutscher Kolonialatlas, 574
German Colonies, New Publications—
Beiträge zur Kenntnis der Deutschen Schutzgebiete, von P. Langhans, 217
Weissbuch, 442
Germany, New Maps—
Fremde Volksstämme in Deutschen Reiche, von P. Langhans, 225
Geologische Karte des Deutschen Reichs, von Dr. Lepsius, 225, 686
Germany, New Publications—
Ergebnisse der Niederschlags-Beobachtungen im Jahre 1893..108
Ergebnisse der Gewitter-Beobachtungen im Jahre 1891, von Dr. Assmann, 108
Fremde Volksstämme im Deutschen Reich, von P. Langhans, 108
Jahresbericht des Direktors des Königlichen Geodätischen Instituts, 107
Laubwaldflora Norddeutschlands, von Dr. Hock, 327
Niederschläge im nordwestlichen Deutschland, von Dr. Moldenhauer 439
Volksgrenzen in Ost und West, von Dr. Kossina, 561
Ghan, Wadi el, Tripoli, 160
Gharian, Tripoli, 158 *et seq.*
Ghubra el Tam, 529
Gibbons, Capt., explorations in the Barotse country, 662
Gighioli, Prof., Il VI. Congresso Geografico Internazionale (New Publications), 340
Gilbert, G. K., The Origin of Hypothesis (New Publications), 684
Gill, Dr. David (New Publications), 339
Gilles, M., Le bassin houiller du Nord (New Publications), 438
Gillett, F., Photographs of Somaliland (New Maps), 452
Girard, J., Les phénomènes eruptifs sous-marins (New Publications), 568
Glacial striæ in the Canadian Rockies, 55
Glaciation and Lake-Basins of Subalpine Switzerland, Dr. du Riche Preller on, 655
Glaciation of the Færoes, 6
Glaciers, New Publications—
De la coexistance . . de deux systèmes de plis conjugués, de M. Haug, 220
Glaciers et période glaciaire, par L. du Pasquier, 567
Influence of débris on the flow of glaciers, by I. C. Russell, 220
Karstformen der Gletscher, von Dr. Sieger, 220
La Commission internationale des glaciers, de M. Forel, 220
Les dépôts glaciaires etc., par MM. Kilian et Penck, 220
Glaisher, Jas., balloon observations, 542, 543
Glaser on the Abyssinians, Review, 420
Glass, J. H., The Great Landslip at Garhwal (New Publications), 677
Glenderamackin Beck, 610
Globe terrestre à l'échelle du Centmillième, Projet de construction d'un, par E. Réclus (New Publications), 117
Globe verrazanien, Un nouveau, par H. Harrisse (New Publications), 222
Globes, Eight small historical, etc., by G. Philip and Son (New Maps), 343
Globigerina ooze of the Great Southern Ocean, 539
Goddard, Mount, and its Vicinity, by J. S. Solomons (New Publications), 444
Godfrey-Faussett, Lieut., Note to Sketch-Map of the Upper Kuyuni, 541
Gogol géographe, par P. C. d'Almeida (New Publications), 223
Goitre in Yarkand, 456
Gold and Silver and the Money of the World, by L. C. Probyn (New Publications), 340
Gold Coast, New Publications—
Further Correspondence relating to Affairs in Ashanti, 442
History of Gold Coast and Asante, by Rev. C. C. Reindorf, 564
Studien von Goldküste, von Dr. E. Mähly, 114
Goldie, Sir G., remarks on the death of Mr. Seebohm, 211
Goldman, S., Map of the Witwatersrand (New Maps), 121
Goldziher und Landberg-Hallberger, Drs., Die Legende vom Barsisâ (New Publications), 340
Gordon and Gotch, The Australian Handbook (New Publications), 682
Gore, F. St. J., Hill Life in the Afghan and Hindu Highlands, etc. (New Publications), 330
Gorges, Post-Glacial, formation of, 620
Goring La, Tibet, 469
Goshen, New Publications—
Hvor laa det gamle Gosen? af Prof. Vald. Schmidt, 563

Gotland, New Publications—
Studier öfver den Gotländska vegetationens, af. R. Sernander, 328
Götzen, Graf von, book on Africa, review of, 273
————————, Der Afrikareisende (New Publications), 222
————————, Durch Afrika von Ost nach West (New Publications), 442
————————, La traversée de l'Afrique centrale (New Publications), 331
————————, Reiseweg . . . in Deutsch-Ostafrika (New Maps), 450
Gouffre de Pierrefeu, exploration du, par M. Chevrot (New Publications), 438
Governmental Maps for use in Schools, Report on, by D. K. Collie (New Publications), 223
Gowen, H. H., Sketches of Hawaiian Scenery and Life (New Publications), 566
Gowland, Mr., remarks on "Exploration in the Japanese Alps," 146
————————, visit to the Japanese Alps, 125
Grabowsky, F., Der Bezirk von Hatzfeldthafen (New Publications), 218
Graetz, Prof. H., History of the Jews (New Publications), 339
Graham's Land, Antarctic, 508
Granatspitzgruppe in den Hohen Tauern, von M. v. Prielmayer (New Publications), 106
Grant, Major S., Diagrams for determining the Parallaxes in Declination, etc., 649
Grasmon, "cloud-burst" on, 620
Gravier, G., Ferd. de Lesseps (New Publications), 339
Gravity Determinations, New Publications—
Relative Schwerebestimmungen, von R. v. Sterneck, 219
Gray, J. A., At the Court of the Amîr (New Publications), 212
Great Bank of Newfoundland, The, 316
Great Lakes and Niagara, Dr. Spencer's studies on the, 204
Great Southern Ocean, extent and climate of, 538, 539
Greece, New Maps—
Vegetations-Karte des Peloponnes, von Dr. Philippson, 226
Greece, New Publications—
Meteorologische und Magnetische Beobachtungen in Griechenland, von H. Hartl, 108
Reisen . . . in Nord-Griechenland, von Dr. Philippson, 439
Greek Bibliography, by Sakkelionos (New Publications), 223
Greely, General A. W., Handbook of Arctic Discoveries (New Publications), 566
————————, Nansen's Polar Expedition (New Publications), 567
————————, Scope and Value of Arctic Exploration (New Publications), 447
Greely, General A. W., The Present State of the Nicaragua Canal (New Publications), 445
Green Mountains in Massachusetts, Geology of the, by Rumpelly, Wolff, and Dale (New Publications), 216
Green, Rev. W. S., remarks on "First Crossing of the Southern Alps of New Zealand," 500
Greenland, New Publications—
Det Arktiske problem og de to Peary—expeditioner, by E. Astrup, 117
Un été au Grœnland, by M. Garde, 117
Gregory, A. C., Geographical History of Australia (New Publications), 682
Gregory, Dr. J. W., Proposed German Barrier across Africa (New Publications), 332
Greim, Dr., Die Fortschritte der Limnologie (New Publications), 118
Grevé, C., Geographische Verbreitung der jetzt lebenden Raubthiere (New Publications), 448
Greville, Hon. Ed., The Year-Book of Australia for 1895 (New Publications), 116
Griffin, Sir L., Kashmir (New Publications), 111
Grindrod, Mrs., Siam: a geographical summary (New Publications), 213
Griswold, L. S., Origin of the Lower Mississippi (New Publications), 334
Groller, M., Die Inselgruppe Pelagosa (New Publications), 326
Groneman, J., De Garĕbĕg's te Ngajogyâkartâ (New Publications), 212
Grossmann, Dr. K., The Faeroes. 1 *et seq.*
Grulich, O., Katalogue der Deutschen Academie der Naturforscher (New Publications), 570
Grum Grjimailo, M. M., journeys in the Eastern Tian Shan, 656
Gruner, Dr. Hans (New Publications), 339
————————, Expedition in the Niger Basin, 96
Gruner, Döring, Dr., and Lieut. v. Carnap, Expedition des Deutschen Togo Komitee's (New Maps), 451
Guatemala, New Publications—
Bureau of American Republics, Bulletin of, 681
Guatós, Tres semanas entre los, por J. Koslowsky (New Publications), 445
Guénot, M., Des effets de Déboisement des montagnes (New Publications), 117
Gugird, or Sulphur hills, Persia, 168
Guiana Maps, 277
Guinea and Equatorial Currents, by J. Y. Buchanan, 267
Guinea en Equatorial Stroomen (von K. Nederlandsch Met. Inst.) (New Maps), 452
Gujarât, New Publications—
The Province of, by A. Rogers, 677
Gulf Stream, New Maps—
Temperaturen in Gulf von Mexico und in Golfstrom, von A. Lindenkohl, 452

Gulf Stream, New Publications—
Resultate der Temperatur . . . des Golfstroms, von A. Lindenkohl, 448
Günther, Dr., C G. Ehrenberg (New Publications), 222
Günther, Prof. O., Die Deutsche Hansa (New Publications), 568
Günther, R. T., on organisms of marine type in Lake Tanganyika, 663
Gur-i-Bahrâm, Persia, 173
Güttner, Herr, on the geographical homologies of coasts, 318
Guyou, E., Problemes de navigation et la carte marine (New Publications), 337

H.

Habasat, or Habis, 420
Hacquart, R., De Marseille à Ségou-Sikoro (New Publications), 214
Haddington, Mount, Antarctic, 628
Haddon, Prof. A. C., Life and Industries in Ireland (New Publications), 561
Haera, Wadi, red iron deposit of, 162
Hahn, Ed., Die Haustiere . . . zur Wirtschaft des Menschen (New Publications), 338
Haig, Major-General, Letter from, on Ancient and Mediæval Makran, 668
Hail el Ghâi, 534, 535
Haitâ, New Publications—
Bureau of American Republics, Bulletin of, 681
Halbfass, Dr., Die Seenforschung in Italien (New Publications), 108
————, observations on the Lakes in the Basin of the Lech, 198
Haldensee, depth, etc., of, 199
Halley's Earliest Equal Variation Chart, by L. A. Bauer (New Publications), 449
Hallig Islands, the Protection of the, 544
Hallowi, Jebel, 527
Halwun, Persia, 39
Hamberg, A., En resa till norra Ishafvet (New Publications), 447
Hamburg, New Publications—
Historische Topographie der Freien und Hansestadt, von W. Melhop, 560
Hammer, Prof., Bemerkung über das "Areal eines Landes" (New Publications), 218
Hammer-Purgstall's account of Kais, 649
Hamy, Dr. E. T., Collection de Dessins de d'Entrecasteaux (New Publications), 568
————, Considérations générales sur les Races Jaunes (New Publications), 221
————, F. et A. d'Albaigne (New Publications), 222
————, Les Français au Spitzberg (New Publications), 561
————, Les imitateurs d'Alexander Brunias, etc. (New Publications), 569
Hann, Prof., on Mean Atmospheric Temperature in the Southern Hemisphere, 556
Hansa, Die Deutsche, von Prof. Günther (New Publications), 567
Hansen, M., Congo Français (New Maps), 228
Harinoki-toge pass, Japanese Alps, 128
Harira ruins, Persian Gulf, 644
Harra, or stony desert, 549
Harris, Col. J., Lecture on New British Route to Pacific (New Publications), 564
Harris, F. R., The Fate of South Africa (New Publications), 443
Harris, W. B., An unbiassed view of the Armenian Question (New Publications), 112
————, Tafilet (New Publications), 214; note on, 274
Harrisse, H., Un nouveau globe verrazanien (New Publications), 222
Hartl, H., Meteorologische und Magnetische Beobachtungen in Griechenland (New Publications), 108
————, Tafeln . . . Meridian und Parallelkreis-Bögen (New Publications), 218
Hassert, Dr., Die natürlichen und politischen Grenzen von Montenegro (New Publications), 109
Hatat, Wadi, 536, 537
Hatzfeldthafen, Der Bezirk von, von F. Grabowsky (New Publications), 218
Haug, M., Contribution . . . lignes directrices de la chaîne des Alps (New Publications), 326
Haug, E., De la coexistance . . . de deux systèms de plis conjugués (New Publications), 220
Haughton, Rev. S., On the Tides of the Arctic Seas (New Publications), 337
Haupt, Lewis M., Commerce and Deep Waterways (New Publications), 570
Hauran, New Publications—
A Journey in the, by Rev. W. Ewing, 213
Hausaland, by C. H. Robinson (New Publications), 215, 443
Haustiere . . . zur Wirtschaft des Menschen, von E. Hahn (New Publications), 338
Hauthal, R., Primera ascension al Nevado Colorado de Famatina (New Publications), 445
Hautreux, M., Courants dans l'Atlantique nord (New Publications), 221, 568
Hauttecœur, H., Andros (New Publications), 108
————. Le rocher de la Belle Hélène (New Publications), 676
Haviland, Dr., expedition to Mount Kinabalu, 430
Hawaii, New Publications—
Constitutional History of, by H. E. Chambers, 446
Hauz-i-Sultan-Kavir, Persia, 165
Sketches of Hawaiian Scenery and Life, by Rev. H. H. Gowen, 566
Heatley, J., The Port of the Upper Nile, etc. (New Publications), 113

Heawood, E., Recent African Books, 270
Heber, Bishop, by Dr. G. Smith (New Publications), 119
Hedin, Dr. Sven, journeys in Central Asia, 195
———————, Reise durch die Takla-Makan-Wüste (New Publications), 110
Hedley, C., Surviving Refugees . . . of Ancient Antarctic Life (New Publications), 337
Heiderich, Dr. F., Die Erde (New Publications), 684
Heimbrod, G., Application of Photography to Topographic Surveying (New Publications), 567
Heintze, W., Eisenbahnen in der Türkei (New Publications), 440
Hellenische Kolonisation, von G. Lachenmaier (New Publications), 568
Hemisphere, Southern, Mean Atmospheric Temperature in the, Prof. Hann on, 556
Hemsley, Prof. W. B., Some Curious Facts in Plant Distribution (New Publications), 338
Hendren, S. R., Government, etc., of the Virginia Indians (New Publications), 334
Herat-i-Kharab, Persia, 27
Hergesell, H., Beobachtungen . . . der Temperatur im Weissen See bei Urbeis (New Publications), 338
Herr und Tinter, Drs., Astronomische arbeiten der Oesterrichischen Gradmessungs-Commission (New Publications), 106
Herrich, A., Wandkarte des Weltverkehrs (New Publications), 574
Herrle, G., The Submarine Cables of the World (New Publications), 685
Hertslet, Sir E., Collection of Treaties . . . between Great Britain and Foreign Powers (New Publications), 571
Hetherington, Miss, Index to the Periodicals of 1894 (New Publications), 223
Hettner, A., Die Lage der Menschlichen Ansiedelungen (New Publications), 118
Heuman, E., Om Santalfolket och dess nuvarande hemland (New Publications), 563
Heure décimale, par MM. Floquet et Sarrauton (New Publications), 447
Hevesi, L., Lebensbild eines Afrikaforschers (New Publications), 569
Heyerdahl, T., "Kane's" Reise langs Spitsbergens vestkyst (New Publications), 117
Hierapolis, Asia Minor, 191
High Cup Gill, Lakeland, 608
High Level Meteorological Station in the Balkan Peninsula, 544
Highways of Commerce, Trade Routes of Foreign Countries (New Publications), 570
Hill, Gray, A Journey East of the Jordan and the Dead Sea (New Publications), 442
Hill, H., Ruapehu, Retrospect and Prospect (New Publications), 116
Hill, R. T., The Panama Canal Route (New Publications), 445
Himalaya, New Publications—
An Artist in the Himalayas, by A. D. McCormick, 441
Die Eiszeit im Himalaya, von Dr. Diener, 441
Reise im Central-Himalaya von Kumaon, etc., by Dr. Diener, 111
Himeria, Rev. de, Padroado de Portugal em Africa (New Publications), 443
Hindu Kush, The Origin of the Kafirs of the, by Col. Holdich, 42 *et seq.*
Hirayu hot springs, Japan, 148
Hirschfeld, G., von H. Prutz (New Publications), 222
Hirt, Dr., Die Urheimat und die Wanderungen der Indogermanen (New Publications), 339
Hirth, F., Chao Ju-kua (New Publications), 339
Hirth, Prof., Zwei Jahre am Yangtze-Kiang (New Publications), 329
Historical Geography, Atlas of, by F. Schrader (New Maps), 228, 574
Hjort, J., Hydrografisk-biologiske studier over norske fiskerier (New Publications), 221
Hock, Dr., Laubwaldflora Norddeutschlands (New Publications), 327
Hodakayama, Japanese Alps, 127, 128
Hofra-en-Nahas copper-mines, 429
Hogböm, A. G., Genombrottsdalar i vart lands (New Publications), 561
Holdich, Col, Notes on Ancient and Mediæval Makran, 387 *et seq.*
———————, Notes on Ancient and Mediæval Makran (New Publications), 677
———————, on the Pamir Boundary Commission, 91, 92
———————, Preliminary Report . . . in connection with the Pamir Boundary Delimitation (New Publications), 441
———————, The Origin of the Kafirs of the Hindu Kush, 42 *et seq.*
Holub, Dr. E., Südafrikanische Ausstellung (New Maps), 124
Hölzel, Herr H, death of, 209
Honduras, New Publications—
Bureau of American Republics, Bulletin of, 681
Hood, Capt., Currents in the Red Sea (New Publications), 221
Hopfensee, depth, etc., of, 199
Hopkins, W., on the radial stream system of Lakeland, 603
Horizontalpendel-Beobachtungen, von Dr. Rebeur-Paschwitz (New Publications), 219
Horizontal pendulums, movements of, 251-255
Hormuz, Persia, 25
Horn, W. A., Scientific Exploration of Central Australia (New Publications), 446

Horne, J. T., Scheme for the triangulation of South Africa, 414
Hough, G. S., Rotation of Elastic Spheroid (New Publications), 683
Howgill fells, 606, 607
Howorth, Sir H., Remarks on "A Journey across Tibet," 481
Hözel, E., Spezialkärtchen in unseren Schulatlanten (New Publications), 684
Hrnun river, Batak Land, 77
Hubbard, Hon. G., Russia in Europe (New Publications), 439
Hudleston, W. H., Notes on Indian Geology (New Publications), 563
Hudson Bay, New Publications—
  Proofs of Rising of Land around, by R. Bell, 564
Hügel, Baron A. von, The Land of the Bataks, 75, 175
———— ————, The Land of the Bataks (New Publications), 563
Hukong river and valley, 93
Hull, Prof. E., On the Physical Conditions of the Mediterranean Basin, etc. (New Publications), 108
Hungary, New Publications—
  Roads from Hungary to Adriatic, by Prof. Fest, 561
Huron, Lake, New Publications—
  Sailing Directions for, 216
Husen-Nun, Persia, 163
Husmann, E., Die Reiskultur in Italien (New Publications), 108
Huygens, C., Lettres de, à Descartes, par C. et H. Adam (New Publications), 222
Huzuls, New Publications—
  Ethnologie . . . der Huzulen, von Dr. Kaindl, 439
Hypothesis, The Origin of, by G. K. Gilbert (New Publications), 684

I.

Ibn Haukal's account of Makran, 395
Ibn Moujávir, on the island of Kais, 646
Icebergs in the Antarctic, 627
Ice Fiord, Spitzbergen, Sir Martin Conway's proposed expedition to, 555
Ice in the Antarctic, 510, 511
Ice, New Publications—
  Experiments in Ice Motion, by E. C. Case, 338
  Growth, etc., of, by P. Vedel, 224
  Ice-Work, Present and Past, by T. G. Bonney, 567
  Isforholdene i Nordhavet, af C. Ryder, 447
Iceland, New Maps—
  Geologische Karte des südöstlichen Island, von Th. Thoroddsen, 226
Iceland, New Publications—
  Fra det nordostlige Island, by Dr. Thoroddsen, 561
  L'Islande, par M. Foulon, 676
Immanuel, Hauptmann, Die Amurprovinz (New Publications), 213
Imperial Federation, A Scheme for, by G. C. Cuningham (New Publications), 223
Inambari river, 187, 188
Inambari, De Riberalta al, by Dr. R. Paz (New Publications), 217
India and Afghanistan, frontier agreement between, 546
India, New Publications—
  Botanical Survey of, by Gammie and Woodrow, 329
  Census of, 1891, Report, etc., by Lieut.-Col. Abbott, 329
  Notes on Indian Geology, by W. H. Hudleston, 563
  Report on Administration of North-West Provinces and Oudh, 677
  Report on Census Operations, 562
  Return of Wrecks and Casualties in Indian Waters, 1894, by H. A. Street, 678
  Six Tactical Problems, etc., by Lieut. Col. Neville, 440
  Survey of India Department, General Report, 330
  Tobacco Industry of India and the Far East, by C. Tripp, 562
  Topography, etc., of Northern India, by H. M. Wilson, 440
India and China, New Publications—
  Treaty Series, Convention between Great Britain and China, etc., relative to Burmah and Tibet, 111
Indian Frontiers and Indian Finance, by Sir A. Colvin (New Publications), 111
Indian Government Surveys (New Maps), 226, 572
Indian North-East Frontier, Expedition on the, 93
Indian Ocean, fauna of islands of the, 283
Indian Territory, by H. Gannett (New Publications), 216, 444
Indo-China and Siam, Boundary Treaties in, 297
————, Prince Henry of Orleans' journeys in, 93
Indogermanen, Die Urheimat und die Wanderungen der, von Dr. Hirt (New Publications), 339
Indus channel, general direction of, 394
Inle lake, Shan States, 579, 580, 585
Insectivora of the Ethiopian Region, 286, 288
Intha tribe, Shan States, 579, 580
Irawadi, source of the, 199, 200
Ireland, New Publications—
  Peasant Life and Industries in, by Prof. Haddon, 56
Iron Gates on the Danube, Ship Canal at, 544
Isfahan, height of, 168
Italian discovery of the Moluccas, 366
Italy, New Publications—
  L'Aspect physique de l'Italie, par C. Pomba, 108
  Reiskultur in Italien, von E. Husmann, 108

Italy, New Publications—*continued*.
Seenforschung in Italien, von Dr. Halbfass, 108
Itawa country, Central Africa, 372
Ivanoff, Lieut., explorations of Siberian rivers, 545
Ivens, Dr. L'Afrique australe et la colonization néerlandaise (New Publications), 215
Ivory Trade in 1895..435
Iwanowski, Dr., [illegible] graphical Skizze [illegible]

J.

Jack, R. L., Stratigraphical Notes on the Georgina Basin, etc. (New Publications), 446
Jackson, Dr. S, Arctic Cruise of the *Bear* (New Publications), 447
Jade trade in Khotan, 456
Jamaica, New Publications—
A West-Indian Island, by Sir H. W. Norman, 335
Handbook of Jamaica for 1896, by Musson and Roxburgh, 566
Jamaica, by Fr. Cundall, 335
Journal of Institute of, 681
Jandak, Persia, 32, 166
Jankó, Dr. J., Land und Leute des Comitates Arad (New Publications), 561
Jannescu, G., Ratiunea geologică a principalelor aliniamente geografice (New Publications), 107
Janssen, M. J., Troisième ascension . . . du Mont Blanc (New Publications), 448
Japan—
Bradyseismical movements in, 232, 233
Earthquakes and volcanoes of, 235
Land fauna of, 136
Mountain systems of, 126
Seismological society of, 239
Japan, New Publications—
Essai sur l'Architecture Japonaise, par F. Levieux, 330
Fortentwicklung . . . des japanischen Kunstgewerbes, von J. Rein, 441
Industrial and Commercial Development of, by J. Troup, 678
Luftströmungen in Japan, von E. Knipping, 441
Petroleum Industries at Nagaska, by H. B. Newell, 441
The Japanese Landscape, by C. MacCauley, 441
Verkehr Japans mit dem Auslande, von Dr. S. Tanaka, 563
Japan, Korea, China, New Publications—
Problems of the Far East, by Hon. G. Curzon, 440
Japanese alpine bell-flower, 136
Japanese Alps, Exploration in the, 1891–94, by Rev. W. Weston, 125 *et seq.*
Japanese Alps, direction of, 126, 127; geological structure, 128, 147; volcanic peaks, 128, 147; passes, 128; rivers and lakes, 129; snowfall on, 130; hot springs and baths, 131, 132; minerals and flora, 134, 147, 148; fauna and birds, 136, 137; archæological remains, 148
Japanese people, hospitality and politeness of the, 138; silk industry of, 139, 140; superstitions, 141–144
Japanische Reise um die Welt, von K. Tamai (New Publications), 225
Java, New Publications—
De Garĕbĕg's te Ngajogyakartá, door J. Groneman, 212
Jeanneret, Philippe, Les Ma-Khoça (New Publications), 563
"Jeannette Relics," The so-called, by Prof. Dall (New Publications), 566
Jebel Ses, 549
Jefferson, R. L, Awheel to Moscow and back (New Publications), 328
Jenks, E., The History of the Australasian Colonies (New Publications), 336
Jeppe, F., Map of the Southern Goldfields of the Transvaal (New Maps), 451
Jews, History of the, by Prof. H. Graetz (New Publications), 339
Jiménez y Lluesma, Los ferro-carriles del Pirineo (New Publications), 677
Johannesburg, New Publications—
Bi-Annual Report, etc, of Sanitary Committee, by Ch. Aburron, 215
Johnson, A C., The Bearings of the Principal Bright Stars, etc. (New Publications), 447
Johnston, W. and A. K., Map of Nubia and Abyssinia (New Maps), 573
——————————, Map of the Transvaal, etc. (New Maps), 342
——————————, Map to illustrate the Armenian Question (New Maps), 342
——————————, Map to illustrate the Ashanti Expedition (New Maps), 121
Johnstone, Major-General H. C., Obituary of, 209
Johnstone, the late Sir J., My Experiences in Manipur, etc. (New Publications), 329
Jordan, W. L, The Cardioid Earth (New Publications), 224
Jordan, New Publications—
Au dela du Jourdan, by M. Gautier, 112
Jordan and the Dead Sea, A Journey East of the, by Gray Hill (New Publications), 442
Jostedal Norvège, Glacier du, by Mme. Martel (New Publications), 109
Jubilee of Russian Geographical Society, 310
Jumma, Jebel, Tripoli, 158, 159
Junker, Wilhelm, von L. Hevesi (New Publications), 569
Junod, H. Une course au Tembé (New Publications), 564

Jura, New Publications—
Grottes du Jura méridional, par M. Corcelle, 438

K.

Kabara, Timbuktu, 99
Kach Gandava, Makran, 399
Kachins, Sana section of the, 93
Kafirs of the Hindu Kush, The Origin of the, by Col. Holdich, 42 *et seq.*
Kafirs, The Afghan Campaign against the, 547
Kahza pass, Oman, 524
Kaindl, Dr., Ethnologie . . . der Huzulen (New Publications), 439
Kais, or Al-Kais, ancient trading centre, 644
Kal-Mura river, Persia, 167
Kama country, delta of the Ogowé, 95
Kamdesh Kafirs, 42
Kami-oroshi, ceremony of the Japanese, 144
Kanát, or subterranean aqueducts, 645
Kanazbun, Makran, 398
Kandabel or Gandava, Makran, 399
Kangéan-Archipel: *see* Malay Archipelago
Kapte or Athi plains, 662
Karafuto system of the Japanese Alps, 126
Karangarua valley, New Zealand, 492
Kara-Timor districts, Batak Land, 79
Karmati ancient tombs, 402
Karpinsky, M., Sur le caractère . . . de l'écorce terrestre dans la Russie d'Europe (New Publications), 328
Kashan, height of, 166
Kashgar to Yarkand, road from, 454
Kashmir, New Publications—
Kashmir, by Sir L. Griffin, 111
Kashmir, by W. R. Lawrence, 329, 441
The Valley of Kashmir, by W. R. Lawrence, 111
Kasr Zuguseh, Ferjana district, 155
Katuaka village, position of, 429
Kavir or Dasht-i-Kavir, Persia, 34, 36, 165, 166
Kayser, Dr. J., Biography of (New Publications), 222
Kea bird of New Zealand, 486, 502
Keane, A. H., Stanford's Compendium of Geography and Travel, vol. ii., South Africa (New Publications), 113; notice of, 275
———, Ethnology (New Publications), 338; notice of, 433
Kej, valley of, Makran, 394
Keng Hung, Shan States, 588
Keng Tung plain, town and churches, 592–595
Kenia, Mount, Dr. Kolb's ascent of, 550
Kenney-Herbert, Capt., Best Method of Teaching Military Sketching (New Publications), 567
Kerbela, New Publications—
A Pilgrimage to, 331
Kergrohen, M., Mission Scientifiques dans le golfe de Gascogne (New Publications), 683
Kerguelen Region, Marine Fauna of the, etc., by Dr. John Murray (New Publications), 337; notice of, 538
Keria to Cherchen, road from, 457
Kéthulle, Ch. de la, Deux années . . . chez le sultan Rafaï (New Publications), 331
———, journey on the borders of Darfur, 428
Khabur river, 658
Khairokot ruins, Makran, 400
Khamptis tribe, 591 *note*
Khamti to Assam, Prince Henry of Orleans' route from, 306
Khamti, the Plain of, 305
Khiva, New Publications—
Bilder aus Chiwa, von H. Vambéry, 441
Khotan, jade trade in, 456
Khur, identification of, 673
Kiang-Kong, Shan States, 584
Kibwesi district, plains of the, 662
Kiepert and Moisel, Karte von Deutsch-Ostafrika (New Maps), 450
Kiepert, Dr. R., "Neue Aufnahmen deutscher Offiziere in Usagara, etc." (New Publications), 563
Kiersnowsky, J., Distribution du vent . . . l'Empire Russe (New Publications), 677
Kikuyu, East Africa, 662
Kilauea, New Publications—
A View of Kilauea, 566
Kilian and Penck, MM., Les dépots glaciaires, etc. (New Publications), 220
Kilimanjaro, rainfall, etc., observations on, taken by Dr. Wildenmann, 429
Kinabalu, Mount, Dr. Haviland's expedition to, 430
Kingsley, Miss M. W., Travels on West Coast of Equatorial Africa (New Publications), 564
———, Travels in West Africa, 95
Kirby, F. V., In Haunts of Wild Game (New Publications), 332
Kirchhoff, Dr., Die Lagenverhältnisse von Erfurt (New Publications), 107
———, Die Marshall-Inseln (New Publications), 336
———, Der "Politischen Geographie" im Schulunterricht (New Publications), 223
Kitao, Dr., Beiträge zur Theorie der Bewegung der Erdatmosphäre, etc. (New Publications), 118
Kitwyi, On a Journey from Machako's to, by J. Ainsworth, 406
Kivu, Lake, Central Africa, 273 *and note*
Kiz or Kej district and town, Makran, 397
Kiz Kaián, Makran, 390
Kizil Robat Gumbaz, 92, 93
Klaksvig, Faeroes, 11
Klein, Dr., Jahrbuch der Astronomie und Geophysik (New Publications), 448
Kling, Hauptmann, Meine Reise in Togoland (New Publications), 563
Knight-Bruce, Bishop G. W. H., Memories of Mashonaland (New Publications), 332

Knipping, E., Luftströmungen in Japan (New Publications), 441
Kobelt, Dr. W., Die zoogeographische Stellung der Insel St. Helena (New Publications), 679
Kolb, Dr, ascent of Mount Kenia, 550
Kolgueff Island, by Colonel Feilden (New Publications), 439
————————, warm currents off, 556
Kondratenko, E., Ethnographical Maps of Transcaucasia, 548
Kootanie, West, Canada, 413
Köppen, N. v., Die Kulturentwickelung Finnlands (New Publications), 109
Kordon, F., Touren im Bereiche des Malleinthales (New Publications), 107
Korea, New Publications—
Gewichte . . . in Korea, von H. Arnous, 330
Körösi, J., und Dr. Thirring, Resultate der Volksbeschreibung und Volkszählung (New Publications), 108
Koslowsky, J., Tres semanas entre los Indios Guatós (New Publications), 445
————————, Algunos datos sobre los Indios Bororós (New Publications), 445
————————, El rol de los Termitos, etc. (New Publications), 449
Kossina, Dr. G., Entwicklung der Germanische Volksgrenzen (New Publications), 561
Kotto river, Congo basin, 203
Kraemer, Dr. A., Ein Planktonausflug . . . Gegend Neu-Seelands (New Publications), 566
Krahmer, Generalmajor, Die altarmenische Hauptstadt Ani (New Publications), 213
————————————, Die Seen der Gouvernements Twer, Pskow und Smolensk (New Publications), 109
————————, Expedition . . . in Mittelasien (New Publications), 677
————————————, Transbaikalien (New Publications), 213
Krassnow, Prof. v., Beobachtungen aus dem Gebiet der nordostasiatischen Inselwelt (New Publications), 442
————————————, The Island of Sakhalin, 422
Kraus, F., Geographie und Höhlenkunde (New Publications), 221
Krauss, P., Spezialkarte von Deutsch-Ostafrika (New Maps), 687
Krebs, W., Das Klima Ost-Asiens (New Publications), 329
Krka, Hydrologie der Unteren, von Dr. Gavazzi (New Publications), 106
Kuen-lun, New Publications—
Das System des Kwenlun, von K. Bogdanowitch, 331
Kuh-i-Rudbar, Persia, 27
Kuh-i-Tezarjun, Persia, 30, 31
Kühr, E., Schetsen uit Borneo's Westerafdeeling (New Publications), 441
Kunlun railway line, 601
Kunz, H., Chile und die Deutschen Colonien (New Publications), 565
Kurmet al Hatheia, Tripoli, 156
Kuryat, Oman, 535
Kurze, G., Reisen norwegischer Missionare in Madagaskar (New Publications), 679
Kusi River, New Publications—
Changes in the Course of the, by F. A. Shillingford, 212
Kuyuni, Upper, Note to Sketch-Map of the, by Lieut. Godfrey-Faussett, 541
Kwilu river, Congo region, 553

L.

Labour question in Central Africa, 374, 375
Labrador peninsula, Mr. Low's explorations in, 414
Lachenmaier, G., Hellenische Kolonisation (New Publications), 568
Ladak, Tibet, 477
Lagos, New Publications—
New Rubber Industry in, 214
Lahontan, Le baron de, par J. E. Roy (New Publications), 222
Lahore, New Publications—
Its History, etc., by Syad Muhammad Latif, 330
Lake-Basins of subalpine Switzerland, 655
Lake District drainage, 621
Lakeland, English, The Waterways of, by J. E. Marr, 602 *et seq.*
————, radial stream-system of, 603 *et seq*; radial drainage and early changes, 610; establishment of fault-valleys, 611; Strike-valleys, 613; changes of the Glacial Period, 613; deviation of stream courses, 616–619; Post-Glacial gorges, 620; stream erosion curves, 621
Lakes in the Basin of the Lech, Dr. Halbfass' observations on, 198
Lamajen tribe on the Mekong, 301
Lamas of Tibet, 470, 472
Langenbeck, Dr., Der erdkundliche Unterricht (New Publications), 223
Langhans, P., Beiträge zur Kenntnis der Deutschen Schutzgebiete (New Publications), 217
————————, Fremde Volkstämme im Deutschen Reich (New Publications), 108, 225
Langstrath alluvial plain, 616
Laodicea, Asia Minor, 191
La Plata Museum, New Publications—
Notas Arqueológicas, etc., por S. A. F. Quevedo, 444
Lapparent, M. de, L'art de lire des cartes Géographiques (New Publications), 683
Lapparent, Prof A. de, Dépressions et déserts (New Publications), 117
Lar, Persia, 25
Lassen, C. H, Momenter af Vestindiens Geografi (New Publications), 217

Last, J. T., Notes on the Languages spoken in Madagascar (New Publications), 214
Latif, Syad Muhammad, Lahore, its History, etc. (New Publications), 330
Launay, A., Mandchourie et Sibérie Orientale (New Publications), 212
Laurent, M., Une visite à la prison de Bokhara (New Publications), 329
Lava Beds at Meriden, Conn., Quarries in the, by Prof. W. M. Davis (New Publications), 334
Lawrence, W. R., Kashmir (New Publications), 329, 441
————, The Valley of Kashmir (New P[illegible]
Lazaro e [illegible]tanicas de la pen[illegible] Publications), 677
Lebanon, New Publications—
Barometrical . . Determination of Heights in Lebanon, by Prof. R. H. West, 678
Lech, Lakes in the Basin of the, Dr. Halbfass' observations, 198
Lee, Sidney, Dictionary of National Biography (New Publications), 449
Lefroy, Mount, Canadian Rockies, 51
Leif Ericson, Flateyjarbok (New Publications), 119
Leitner, Dr., New Dangers and Fresh Wrongs (New Publications), 111
Lemnos, L'île de, par M. de Launay (New Publications), 109
Lemurs of Madagascar, 289
Lena Delta, New Publications—
Beobachtungen der Russischen Polarstation an der Lenamündung, von Fuss, Müller und Jürgens, 112
Lenthéric, Ch., The Riviera, translated by Dr. West (New Publications), 212
Lenz, O., Die Maltagruppe (New Publications), 328
Lenz, Prof., Publicationen von (New Publications), 569
Leonhard and Volz, Das mittelschlesische Erdbeben (New Publications), 676
Lepsius, Dr., Geologische Karte des Deutschen Reichs (New Maps), 225, 686
Lesseps, F. de, par G. Gravier (New Publications), 339
Levellings, New Publications—
Dos nivelamentos de precisão e da sua superficie de referencia, pelo Conde d'Avila, 117
Schätzungsgenauigkeit an Maassstäben, etc., von Dr. Reinhertz, 447
Leverett, F., The Preglacial Valleys of the Mississippi (New Publications), 114
Levieux, F., Essai sur l'Architecture Japonaise (New Publications), 330
Lhasa, Dr. Moewis' attempt to reach, 95
——, Mr. Littledale's attempt to enter, 469–473
Liberia, New Publications—
Third Report . . . New York State Colonization Society, by O. T. Cook, 563
Library Catalogue, New Publications—
Catalogue of Library of, Ceylon Branch of Royal Asiatic Society, 570
Katalog der Bibliotek . . . Deutschen Akademie, von O. Grulich, 570
Licona river, Sanga basin, 552
Likuala river, Sanga basin, 552
Limnology, New Publications—
Die Fortschritte der Limnologie, von Dr. Greim, 118
Limpricht, Dr., Begleitworte zu den Karten "Reiseroute der Expedition des deutschen Kamerunkomitees" (New Publications), 114
Linden, Graf K., Gedächtnisrede zu Ehren . . . E. Metzger (New Publications), 569
Lindenkohl, A., Resultate der Temperatur . . . des Golfstroms, etc. (New Publications), 448
————, Spezifisches Gewicht . . . im Golf von Mexico und im Golfstrom (New Maps), 452
Lipari Islands, New Publications—
Die Liparischen Inseln, by Archduke Ludwig Salvator, 328
Lissus tribe on the Mekong, 301
Lister, A., Guide to the British Mycetozoa (New Publications), 448
Listu, R., Viage a los Andes Australes (New Publications), 682
Littledale, St. G. R., A Journey across Tibet, etc., 453 *et seq.*
————, arrival in England, 198
Littlehales, G. W., Improbability of finding Isolated Shoals, etc. (New Publications), 448
————, The Form of Isolated Submarine Peaks (New Publications), 338
Loangwa river, Central Africa, 372
Lobley, J. Logan, Volcanic Phenomena (New Publications), 568
Lóczy, Prof. L. von, von Prof. Palóczy (New Publications), 339
Longmans & Co., Relief Map of England and Wales (New Maps), 342
Lophiomys of Africa, 285
Lord, W. F., The Lost Possessions of England (New Publications), 685
Lorenz—Jordell, Catalogue . . . Librairie Française (New Publications), 570
Lorenz-Liburnau, Dr. J. v., Donau-Studien (New Publications), 438
Lorenzo Marques, New Maps—
Esboço da Carta do Districto do Lourenço Marques, por E. de Noronha, 687
Lorenzo Marques, New Publications—
Acerca de Lourenço Marques, by A. de Castilho, 443
Lourenço Marques, by P. Berthoud, 563
Lösses, Alter und die Verbreitung des, von Du Pasquier and Penck (New Publications), 683
Louise, Lake, in the Canadian Rocky Mountains, by W. D. Wilcox, 49 *et seq.*

Low, A. P., explorations in the Labrador peninsula, 414
Loweswater, Lakeland, 618
Loyalty Islands, New Publications—
Notes pittoresques sur les îles Loyalty, par M. Bénet, 218
Lu river of Tibet, 200
Lubbock, Sir J., On the General Configuration of the Earth's Surface (New Publications), 338
Luchuan Language, Essay in aid of a Grammar and Dictionary of the, by B. H. Chamberlain (New Publications), 441
Ludwig Salvator, Archduke, Columbretes (New Publications), 108
———————, Die Liparischen Inseln (New Publications), 328
Luena river, Central Africa, 663
Luftanstauches zwischen beiden Hemisphären, Zur Frage des jahreszeitlichen, von O. Baschin (New Publications), 118
Lugard, Capt. F. D., A Journey in West Africa, etc. (New Publications), 114
———————, England and France in the Nile Valley (New Publications), 214
———————, New British Markets, III. Tropical Africa (New Publications), 113
———————, The Extension of British Influence in Africa (New Publications), 112
Lune, source of the, 613
Lune and Eden, the initiation of the, 605
Lus Bela, Makran, 388, 398, 399
Lyall, Sir J. B., Punjab Irrigation (New Publications), 441
Lycos valley, Asia Minor, 191
Lyde, L. W., Man on the Earth, etc. (New Publications), 340
Lynch, H., The Armenian Question (New Publications), 440
Lynn, W. T., C. Ptolemy and his Works (New Publications), 569

M.

MacCauley, C., The Japanese Landscape (New Publications), 441
Macgregor, Sir W., British New Guinea (New Publications), 116
———————, Journey across Fergusson Island, 432
Machado, J., O territorio de Manica e Sofala, etc. (New Publications), 443
Machako's to Kitwyi, On a Journey from, by J. Ainsworth, 406
Mackinder, H. J., lectures on "The Principles of Geography," 91
———————, Remarks on "Proposed Geographical Description of the British Islands," 357
———————, Remarks on "The Waterways of English Lakeland," 624
MacMahon, Major, Terrestrial Refraction (New Publications), 218
Maçoudi, Note sur un ouvrage attribué à, par M. de Vaux (New Publications), 684
Macoun, J., The Forests of Canada (New Publications), 114
Macronisi, New Publications—
Le rocher de la Belle Hélène, par H. Hauttecoeur, 676
Madagascar, fauna of, 287
Madagascar, New Publications—
Antananarivo Annual, etc., by Revs. Sibree and Baron, 443
Ce qu'il faut connaître de Madagascar, by Caustier and others, 113
Flore de Madagascar, par E. Bureau, 443
La colonisation à, par Dr. F. Delisle, 679
Languages spoken in, by J. T. Last, 214
Les peuples de Madagascar, par H Mager, 332
L'importance de Madagascar, par M Nogues, 214
Madagascar, les forêts, le caoutchouc, par G. Vasco, 214
Madagascar, par M Martineau, 332
Madagascar, von Dr. Spielmann, 443
Reisen norwegischer Missionare in, von G. Kurze, 679
Madras, New Publications—
Report on Administration of Madras Presidency, 1894-95.. 677
Madre de Dios, islands of, 188; tribes of, 189
———————, Recent discoveries in the Basin of the, by C. R. Markham, 187
Madsen, O. E., Om Betydningen af Landenes geografiske Forhold for deres Magtomraade (New Publications), 685
Mæander Valley, Middle, Asia Minor, 192
Magdalena, New Maps—
Carta corográfica del Departemento de, por F. Simons, 228
Mager, H., Les peuples de Madagascar (New Publications), 332
Magnetic Intensity, New Publications—
[illegible]
[illegible]
tät, von Dr. Fritsche, 219
Magnetism, New Publications—
Der normale Erdmagnetismus, von W. von Bezold, 568
Magnus, Olaus, New Publications—
Haus framställning af nordens geographie, af K. Ahlenius, 568
Mahaffy, J. P., The Empire of the Ptolemies (New Publications), 332
Mahdist Power on the Upper Nile, M. Wauters on, 552
Maheyrun, Persia, 24
Mähly, Dr. E., Studien von Goldküste (New Publications), 114
Main, Capt W. S., observations on the Great Bank of Newfoundland, 316
Maistre, M., Book on Africa, Review of, 271

Makran, Letter from Mr. G. N. Curzon on the etymology of, 557
———, Ancient and Mediæval, Letter from Major-Gen. Haig on, 668
———, meaning of name, 388, 669; ruins and sepulchres, 389; waves of migration through, 391; topography, 394, 670; decline of, 393; valleys of, 394; ethnology of, 669
———, Notes on Ancient and Mediæval, by Colonel Holdich, 387 *et seq.*
Makran, New Publications—
Notes on Ancient and Mediæval Makran, by Colonel T. H. Holdich, 677
Malagasy Subregion of the Geography of Mammals, 287
Malaio-Polynesische Forschungen, von Dr. Brandstetter (New Publications), 222
Malay Archipelago, New Publications—
Bijdrage tot de Kennis van den Kangéan-Archipel, door J. van Gennep, 441
Malay Sketches, by F. A. Swettenham (New Publications), 330
Maler, T., Yukatekische Forschungen (New Publications), 115
Malta, New Publications—
Die Maltagruppe, von O. Lenz, 328
Malta and the Maltese Race, by Rev. W. Bedford, 439
Malteinthal, New Publications—
Touren im Bereiche des Malteinthales, von F. Kordon, 107
Mammal-Fauna of the Ethiopian Region, 284
Man in the Tropics, Dr. Däubler on (New Publications), 339
Man on the Earth, etc., by L. W. Lyde (New Publications), 340
Manchuria, New Publications—
Mandchourie et Sibérie Orientale, par A. Launay, 213
Mandalay, line of railway from, 588
Manica e Sofala, O territorio de, by J. Machado (New Publications), 443
Manila Observatory, New Publications—
Baquios 6 Tifones de 1894, por J. Algué, 213
Manipur, New Publications—
My Experiences in, by the late Sir J. Johnstone, 329
Mankind, The History of, by F. Ratzel (New Publications), 118
Manyala, E. Africa, 410
Maps, Local, in American Schools, Prof. Davis on, 665
Maps, New—
Africa, 121, 228, 342, 450, 573, 687
America, 121, 228, 342, 451
Asia, 226, 342, 572, 687
Australasia, 451, 573, 688
Charts, 122, 228, 343, 452
Europe, 120, 225, 341, 449, 572, 686
General, 228, 342, 452, 574
Maps, New Publications—
L'art de lire des cartes geographiques, par M. de Lapparent, 683
Maps, New Publications—*continued.*
Projet d'une carte de la terre au 1: 1,000,000, par A. Germain, 117
Réduction des cartes topographiques à la même échelle, par M. Venukoff, 447
Sokaart-Archivets Antike Kaartsamling, 119
Sopra tre speciali projezioni meridiane, etc., by M. Fiorini, 119
Ueber die Wahl der Projektionen für die Länderkarten, etc., von Dr. Bludau, 117
Marbut, C. F., Geographic Development of Crowley's Ridge (New Publications), 333
Marchand, Capt., Sept ans d'Afrique (New Publications), 114
Marine deposits and sea water from the Antarctic, Dr. Murray's reports on, 517
Marine Fauna of the Kerguelen Region, Dr. J. Murray on, 538
Marine type in Lake Tanganyika, Organisms of, 663
Markham, Clements R.—
Boundaries of British Guiana, The Evidence of Maps, 277, 309
Election as Honorary Member of Geneva Geographical Society, 90
Honour to, 654
Note on British title to British Guiana, 100
Recent Discoveries in the Basin of the River Madre de Dios, 187
Remarks on "A Journey across Tibet," 478, 482
Remarks on an Antarctic Expedition, 325
Remarks on centenary of John Cabot's voyage, 675
Remarks on Col. Trotter's journey to source of the Niger, 436
Remarks on death of Gen. Walker and Cristoforo Negri, 437
Remarks on death of Lady Burton, 559
Remarks on death of Mr. Childers, 325
Remarks on "Exploration in the Japanese Alps," 146, 149
Remarks on "First Crossing of the Southern Alps of New Zealand," 499, 502
Remarks on "Movements of the Earth's Crust," 247
Remarks on "Proposed Geographical Description of the British Islands," 356, 360
Remarks on Rumours of Nansen's Expedition, 436
Remarks on "The Country of the Shans," 600
Remarks on "The Færoes," 22, 23
Remarks on "The Waterways of English Lakeland," 622, 625
Markoff, Dr. A., Der zukünftige Handel Chinas (New Publications), 440
———, The Towns of Northern Mongolia (New Publications), 440
Marr, J. E., The Waterways of English Lakeland, 602 *et seq.*

Mars et la Terre, par M. Gautier (New Publications), 224
Marseilles, New Publications—
L'extension . . . du massif ancien des Maures, par M.M. Vasseur et Fournier, 439
Marshall Islands, The, by Dr. Steinbach, 296
Marshall Islands, New Publications—
Die Marshall-Inseln, von Dr. A. Kirchhoff, 336
Steinbach and Schwabe's work on the, 218
Martel, E. A., Spelæological Society founded by, 434
————, Sous Terre (New Publications), 221
————, Sur quelques anomalies de la température des sources (New Publications), 449
Martel, Mme. A., Traversée du Glacier du Jostedal Norvège (New Publications), 109
Martin, Hon. G. B, Map of the Province of British Columbia (New Maps), 342
Martineau, M., Madagascar (New Publications), 332
Masha, Persia, 31
Máshi, Persian Gulf, 644
Mashonaland, New Publications—
Memories of, by G. W. Knight-Bruce, 332
Maskan, Makran, 403
Massachusetts, New Publications—
Geology of the Green Mountains in, by Rumpelly, Wolff, and Dale, 216
Mathews, R. H, Aboriginal Bora held at Gundabloni in 1894 (New Publications), 116
————, Aboriginal Rock Pictures of Australia (New Publications), 116
Mathiesen, Gén., Les vents et les courants de la Mer (New Publications), 220
Matsushiro, archæological remains at, 148
Mauch, Christoph, Der Bernstein (New Publications), 570
Maumené, M., Bizerte et son nouveau port (New Publications), 215
Mauritius, fauna of, 284
May, Capt. W. W., Obituary of, 324
Maydon, J. G, Natal (New Publications), 563
Mayr, Dr., Zur Technik der Ausbeutung berufsstatistischer Angaben (New Publications), 569
Mazauric, F., Les cavernes de la Boudène au Mas Cabanis (New Publications), 438
McAlpine, D., Australian Fungi, etc. (New Publications), 336
McCormick, A. D., An Artist in the Himalayas (New Publications), 441
McInnes, Mr., work in Western Ontario, 413
M'Crindle, J. W., Arabia and Abyssinia in Ancient Times (New Publications), 570
Medals, Royal, and other awards for 1896..654
Mediterranean, New Publications—
Columbretes, by H.I.H. Archduke Ludwig Salvator, 108
Erforschung des östlichen Mittelmeeres, 448
Mediterranean Winter Resorts, by E A. Reynolds-Ball, 685
Physical Conditions of the Mediterranean Basin, etc., by Prof. E Hull, 108
Meeson, J. T., Notes on the Meteorology of Canterbury and Westland, etc. (New Publications), 116
Meetings of the R.G.S., Session 1895-96.. 105, 106, 211, 325, 436, 437, 559, 560, 675
Meinecke, G, Aus dem Lande der Suaheli (New Publications), 442
Mekiskan river, Canada, 316
Mekong river, Shan States, 583, 584
————, affluents of, 586
Mekong river, 94, 302
————, navigation of the, 200
———— to Assam, Prince Henry of Orleans' Journey from the, 199
Melhop, W., Historische Topographie der Freien und Hansestadt Hamburg (New Publications), 560
Men and Women of the Time, by V. G. Plarr (New Publications), 119
Mendaña, A. de, Viaje que hizo. por D. C. F. Duro (New Publications), 684
Mendoza, New Publications—
Topográfico y Geológico de San Cárlos, etc., 444
Menéres, A. da F., Relatorio . . . da Associação Commercial do Porto (New Publications), 439
Menon, C. A., Report on the Census of Cochin (New Publications), 329
Menschlichen Ansiedelungen, Die Lage der, von A. Hettner (New Publications), 118
Mercié, E., De l'Annam au Mékong (New Publications), 111
Meriden, Quarries in the Lava Beds at, by W. M. Davis (New Publications), 334
Mersey, New Publications—
Navigation of River Mersey, by Admiral Richards, 561
Sea Approaches to the Mersey, by Lieut. M. Sweny, 561
Mesny's Chinese Miscellany (New Publications), 111
Metchnikoff, L., Que signifie le nom de Yangtze? (New Publications), 562
Meteorological Congress, International, Report of, edited by O. L. Fassig (New Publications), 220
Meteorological Observations at Stations of the Second Order for 1891 (New Publications), 328
Meteorological Station, High-level, in the Balkan Peninsula, 544
Meteorology, New Publications—
Die Wetterdienst an der Deutschen Seewarte, von Dr. van Bebber, 118

Meteorology. New Publications—*contd.*
Ergebnisse der Gewitter-Beobachtungen im Jahre 1891, von Dr. Assmann, 108
Ergebnisse der Niederschlags-Beobachtungen im Jahre 1893..108
Étude sur la loi des tempêtes, par A. Schwérer, 220
Jahrbücher . . . fur Meteorologie and Erdmagnetismus, 683
La circulation des vents, par M. Duponchel, 118
Meteorologische und Magnetische Beobachtungen in Griechenland, von H. Hartl, 108
Phénomènes des hautes regions de l'atmosphere, par A. Cornu, 568
Theorie der Bewegung der Erdatmosphäre, etc., von Dr. Kitao, 118
Variations de la vitesse des vents, etc., par J. Plumandon, 220
Zur Frage des jahreszeitlichen Luftanstauches, etc., von O. Baschin, 118
Metzger, E., Verkehrsmittel und der Mensch (New Publications), 568
————, von K. von Linden (New Publications), 569
————, Württembergische Forschungsreisende, etc. (New Publications), 569
Meuleman, E., Étude sur les animaux domestiques au Congo (New Publications), 442
Meunier, S., Essai d'application de la méthode expérimentale à l'histoire orogénique de l'Europe (New Publications), 117
Mewius, F., Zur Südpolarforschung (New Publications), 447
Mexican Drainage Canal, by F. H. Cheesewright (New Publications), 444
Mexico, Gulf of, New Maps—
Oberflächenwassers im, von A. Lindenkohl, 452
Mexico, New Publications—
Beiträge zur Ethnographie von Südost-Mexiko und Britisch-Honduras, von Dr. Sapper, 115
Die Grenze zwischen Mexico und Guatemala, von Dr. Polakowsky, 115
Explorations in Cape Region of Baja California, by G. Eisen, 679
On the Bio-Geography of, by C. H. T. Townsend, 333
Meyer, Dr. H., Der Insel Tenerife und ihre Bewohner (New Publications), 113, 331
Mezara, Oman, 534
M'Gee, W., Potable Waters of the Eastern United States (New Publications), 216
Michow, H., Geograpische Ausstellung . . . in London (New Publications), 684
Middendorf, E. W., Peru, Beobachtungen und Studien, etc. (New Publications), 335
Miessler, A., Prof. Dr. J. Euting (New Publications), 569
Miessler, A., Prof. G. Fritsch (New Publications), 569
————, Oskar Borchert (New Publications), 339
————, M. D. Cowan (New Publications), 339
Mijlas, Wadi, 536
Miles, Col. S. B., Journal of an Excursion in Oman, 522 *et seq.*
Military Geographical Institute in Vienna, 91
Military Sketching, On Best Method of Teaching, by Capt. Kenney-Herbert (New Publications), 567
Mill, Dr. H. R., Geography as a Science in England (New Publications), 340
————, Proposed Geographical Description of the British Islands on the basis of the ordnance survey maps, 345 *et seq.*
————, Recent Geographical Bibliographies, 72
————, Remarks on "The Waterways of English Lakeland," 624
————, The Venezuela and British Guiana Boundary (New Publications), 217
Millosevich, Prof. E., Commemorazione del Principe E. Ruspoli (New Publications), 223
Millson, Alvan, Obituary of, 668
Millspaugh, C. F., Contribution to the Flora of Yucatan (New Publications), 444
Milne, F. A., English Topography (New Publications), 110
Milne, Prof. John, Movements of the Earth's Crust, 229 *et seq.*
————, remarks on "Exploration in the Japanese Alps," 149
Min river, Western China, 201
Mississippi, New Publications—
Origin of the Lower, by L. S. Griswold, 334
Pike's Expeditions to Headwaters of the, edited by E. Cones, 444
Preglacial Valleys of the, by F. Leverett, 114
Prehistoric Man at the headwaters of the, by J. V. Brower, 565
Missouri Geological Survey, vols. iv. to vii. (New Publications), 334
Mitre, B., Ulrich Schmidel (New Publications), 569
Mizon, M., Résultats scientifiques des voyages de (New Publications), 214
Mlanje Mountain, Central Africa, 370
Moab and Gilead, Narrative of an Expedition to, by Dr. Bliss (New Publications), 112
Mockler-Ferryman, Capt., Photographs of Norway, 344
Moeris, Ein altes Heiligtum an den Ufern des, von G. Schweinfurth (New Publications), 214
Moëro, Lake, New Publications—
Au lac Moero, par Descamps, 213

Moewis, Dr., attempt to reach Lhasa, 95
Mohn, Dr. H., Jahrbuch des Norwegischen Meteor. Instituts (New Publications), 676
Moï, Une incursion chez les, par M. d'Enjoy (New Publications), 111
Molard, J., Cours de Géographie (New Publications), 224
Moldenhauer, Dr., Niederschläge im nordwestlichen Deutschland (New Publications), 439
Molengraaf, Prof., Die Nederlandische Expedition nach Zentral-Borneo (New Publications), 110
Molesworth, Sir G., Report on Proposed Railway from Mombasa to Victoria Nyanza (New Publications), 112
Moluccas, Discovery of the, by Dr. O. Warburg, 365
Moluccas, New Publications—
Wer ist der Entdecker der Gewürz-Inseln? von Dr. O. Warburg, 563
Mombasa to the Victoria Nyanza, The New Road from, 662
Mombasa to Victoria Nyanza, Report by Sir G. Molesworth on Proposed Railway from (New Publications), 112
Monaco, Prince A. de, Sur la deuxième campagne scientifique de la *Princesse-Alice* (New Publications), 220
Mong Hang, subterranean river at, 582
Mongolia and Manchuria, M. Chaffanjon's Journey in, 550
Mongolia, New Publications—
Die Mongolei-Ethnographische Skizze, von Dr. Iwanowski, 111
Towns of Northern Mongolia, by Dr. A. Markoff, 440
Montaner, Don Ramon, Limites con la República Arjentina (New Publications), 217
Mont-Blanc, Troisième Ascension à l'Observatoire, par M. Janssen (New Publications), 448
Monteil, Col., De St. Louis à Tripoli, review of, 270
Montenegro, New Publications—
Natürlichen und politischen Grenzen von Montenegro, von Dr. Hassert, 109
Mooney, J., The Siouan Tribes of the East (New Publications), 216
Morgan, E Delmar, remarks on "A Journey across Tibet," 481
Morgan, J. de, Mission Scientifique en Perse (New Publications), 112, 331
Morphology of Coasts, 318
Morris, Dr. D., The Sisal Industry in Bahamas (New Publications), 566
Moscow and back, Awheel to, by R L. Jefferson (New Publications), 328
Mosedale, Lakeland, 615
Moshi on Kilimanjaro, rainfall, etc., observations at, taken by Dr. Wildenmann (New Publications), 332; note on, 429
Mosquito Küste, Der Streit um die, von J. Richter (New Publications), 445
Mossman, R C., The Frost of 1895 in Scotland (New Publications), 677
Mountain growth, 232
Movements of the Surface Waters of the North Sea, by H. N. Dickson, 255 *et seq.*
Msid, Jebel, Tripoli, 156
Mueller, Baron von, Select Extra-Tropical Plants, etc. (New Publications), 221
Mugger Pir, or Manja Pir, Makran, 401
Mugheira, Wadi, 524
Muhso tribe, Shan States, 597, 601
Muller, Dr., Beiträge zur Lehre der Wortzusammensetzung, etc. (New Publications), 685
Muller, J. J. A., De verplaatsing van eenige Triangulatie-Pilaren in de Residentie Tapanoeli (Sumatra) (New Publications), 212
Mullet and Inishkea Islands, Ethnography of, by C. R. Browne (New Publications), 328
Mundame und Baliburg, Ueber das Gebiet zwischen, von G. Conrau (New Publications), 332
Munro, Anderson, and Anthony, Messrs., Photographs of North-West Asia Minor (New Maps), 344
Munro, Dr, Rambles and Studies in Bosnia-Herzegovina (New Publications), 212
Murman Coast, warm current along the, 556
Murray, Dr. John, Marine Fauna of the Kerguelen Region (New Publications), 337; note on, 538
————————, remarks on marine deposits, etc, from the Antarctic, 517
————————, The *Challenger* Medal presented by, 206
Muscat, by J. T. Bent (New Publications), 110
Muskeg, The Land of the, by H. Somers Somerset (New Publications), 114
Musson and Roxburgh, Handbook of Jamaica for 1896 (New Publications), 566
Mweru, Lake, desiccation of, 368
————————, elephants in district of, 374
————————, Mr. Weatherley's New Route to, 204
Mweru, meaning of word, 378
Myggenæs, Færoes, 14–17

N.

Naalso, Færoes, 10
Nachimbwe's village, 183, 184
Nanga Parbat Range, Climbing on the, by Dr. J. N. Collie (New Publications), 441
Nansen, Dr., North Polar Expedition, 317, 433, 436, 555
Nansen's Polar Expedition, by Gen. A. W. Greely (New Publications), 567
Natal, New Publications—
Natal, by J. G. Maydon, 563
Nathorst, A. G., Frågan om istiden . . . Europa (New Publications), 560

Natural Sciences, Formulation of the, by E. D. Cope (New Publications), 685
Nautical Almanac and Astronomical Ephemeris for 1899 (New Publications), 219
Navas, Conde de las, Juan de la Cosa y su Mapa Mundi (New Publications), 683
Navigation, New Publications—
Fast Passages and Best Routes, by W. Allingham, 567
How to manage a ship in a typhoon, by Dr. Doberck, 567
Navigation et la carte marine, Problèmes de, par M. Guyon (New Publications), 337
Negri, Cristoforo, Obituary of, 435
Netherlands, Royal Meteorological Institute of the, Atlas of the, 267
Neumann, Dr. E., Die Grundlinien Anatoliens und Centralasiens (New Publications), 329
————, Die methodischen Fragen in der Geographie (New Publications), 340
————, Reisen in Anatolien (New Publications), 329
Neumann, Prof. L., on Geographical Methods, 665
Neumayer, Dr, Stiller Ozean, Atlas von 31 Karten, Herausgegeben von (New Maps), 683
Nevado Colorado de Famatina, Primera ascension al, por R. Hauthal (New Publications), 445
Neville, Lieut.-Col., Six Tactical Problems, etc. (New Publications), 440
New Caledonia, New Publications—
L'Archipel de la Nouvelle-Calédonie, par A. Bernard, 116
New England, New Publications—
Vital Statistics of the New England States for 1892..114
New Guinea, Sir W. Macgregor's journey across Fergusson Island, 432
————, Dutch, Lieut. Velthuyzen's explorations in, 432
————, Herr O. Ehlers' last expedition in, 431
New Guinea, New Publications—
British New Guinea, by Sir W. Macgregor, 116
Discovery of the Great Purari River, by T. Bevan, 218
New Hebrides, New Publications—
Report on Solfataras and Sulphur Deposits of Vanua Lava, by Rendle and Levat, 566
New South Wales, New Publications—
Aboriginal Rock Paintings, etc., in, by R. H. Mathews, 116
Annual Report of the Department of Lands, 1894..446
Historical Records of, by F. M. Bladen, 446
Wealth and Progress of, by T. A. Coghlan, 446
New Zealand Alps, flora of, 485, 502; glacial period, 486; birds of, 489, 502
New Zealand, First Crossing of the Southern Alps of, by E. Fitz Gerald, 483 *et seq*
————, Photographs of the Southern Alps of, by E. A. Fitz Gerald, 576
New Zealand, New Publications—
Avifauna Neu-Seelands, von Dr. Finsch, 446
Ein Planktonausflug . . . gegend Neu-Seelands, von Dr. A. Kraemer, 566
History of, by G. W. Rusden, 446
Meteorology of Canterbury and Westland, etc., by J. T. Meeson, 116
Mr. Fitz Gerald's work in, 116
Official Year Book for 1895, by E. J. von Dadelszen, 336
Reports on Mining and Minerals, 682
Statistics of the Colony for 1894..566
Newell, F. H., Public Lands and their Water Supply (New Publications), 680
————, Results of Stream Measurements (New Publications), 115
Newell, H. B., Petroleum Industries at Nagaoka (New Publications), 441
Newfoundland, The Great Bank of, Capt Main's observations on, 316
Ngolo, New Publications—
Resa till Ngolo-landet, etc., af G Waldau, 563
Niagara, Dr. Spencer's studies on the Great Lakes and, 204
Niagara, New Publications—
Duration of Niagara Falls and History of the Great Lakes, by J. W. Spencer, 115
Niam-Niam, New Publications—
Premiers éléments de langue Sandeh, ou, par A. Colombaroli, 333
Nicaragua Canal, the, 316
Nicaragua Canal, New Publications—
Interoceanic Canal through Nicaragua, 565
Present State of Nicaragua Canal, by Gen. A. W. Greely, 445
Report on Nicaragua Canal, by Capt. G. P. Scriven, 565
The Key of the Pacific, the Nicaragua Canal, by A. R. Colquhoun, 217
Nicaragua, New Publications—
Bureau of A. Republics, Bulletin of, 681
Du lac . . . par le fleuve San Juan, par P. Biolley, 565
Lecture on Nicaragua, by A. R. Colquhoun, 335
Nielsen, Dr., Elvind Astrup (New Publications), 449
Niger Basin, Dr. Gruner's Expedition in the, 96
Niger Delta to the Benin River, Major Copland-Crawford's journey from the, 661
——, Capt. Toutée's Expedition on the, 97
—— Region, Upper, Lieuts. Hurst and Bluzet's Explorations in the, 98

Niger, Source of the, Col. Trotter's visit to, 313
——, Swamps of the, 271
Niger, New Publications—
La France recule au Niger, par G. Demanche, 333
Ueberblick über die Niger-Expeditionen, etc., 1895, von B. Förster, 114
Upper Niger and Soudan, by L. Nott, 333
Nikitin, S., Bibliothèque Géologique de la Russie (New Publications), 676
Nile Reservoirs, The, by H. D. Pearsall (New Publications), 214
Nile, Upper, The Mahdist power on the, M. Wauters on, 552
Nile Valley, England and France in the, by Capt. F. D. Lugard (New Publications), 214
Nile, New Publications—
The Port of the Upper Nile, etc., by J. Heatley, 113
Nilis, Capt., explorations between the Welle and Darfur, 203
Nilis and de la Kéthulle, MM., journeys on the Borders of Darfur, 428
Ninchen-Tangla Range, Tibet, 467
Nisíbin or Nesíbin, 658
Niuafóu, Island of, letter from Coutts Trotter on the, 210
———, South Pacific, Account of a Visit to, by Lieut B. T. Somerville, 65 *et seq.*
Nivelamentos de precisão eda sua superficie de referencia, by C. d'Avila (New Publications), 117
Nodushan, Persia, 170
Nogues, M., La puissance maritime de l'Angleterre et l'importance de Madagascar (New Publications), 214
Nordenskiold, G., Om Björlings och Kallstenii expedition (New Publications), 447
Nordenskjöld, O., El Islandet (New Publications), 445
Norderney, New Publications—
Blumen . . . der Insel Norderney, von C. Verhoeff, 439
Norikura, Japanese Alps, 127, 128
Norikura-yu hot springs, Japan, 148
Norman, Sir H. W., A West India Island (New Publications), 335
————————, Capt. Cook and his First Voyage, etc. (New Publications), 336
Noronha, E. de, Esboço da Carta do Districto de Lourenço Marques (New Maps), 687
North-East Passage, Story of the (New Publications), 447
North Pole, M. Andrée's proposed balloon voyage to the, 206, 325
————, Dr Nansen's Expedition to the, 317, 433, 436, 555
North Pole to Equator, From, by A. E. Brehm: translated by M. R. Thomson (New Publications), 680
North Sea, The Movements of the Surface Waters of the, by H. N. Dickson, 255 *et seq.*
Norway, New Publications—
Die Norwegische Commission der Europäischen Gradmessung, 109
Hydrografisk-biologiske studier over norske fiskerier, af J. Hjort, 221
Jahrbuch des Norwegischen Meteor Instituts für 1892, von Dr. H. Mohn, 676
Sydvestlige Norges anthropologiske forhold, ved C. Arbo, 439
Varangerfjord Region, etc., by H. Reusch, 439
Norway, Photographs of, by Capt Mockler-Ferryman, 344
Nott, Lewis, The Upper Niger and Sudan (New Publications), 333
Nova Scotia, Messrs. Fletcher and Faribault's work in, 414
Novaya Zemlya, M. Chernyshev's expedition to, 206, 425
Nutt, W. H., Journey to Lake Rukwa, 427
Nyasa districts, slave trade in the, 380, 382
——— lake, desiccation and depths of, 368; volcanic region of, 369
Nyenchen-tang-la, Tibet, 482
Nysa, ancient city and people of, 45

O

Oates, W. E., Obituary of, 667
Ob bay and river, explorations of the, 545, 546
Obermair, L., Zur alpinen Kartographie (New Publications), 218
Obrucheff, B. W., expedition in Siberia, 95
————————, Orography of Central Asia (New Publications), 440
————————, Verwitterungs . . . in Central-Asien (New Publications), 562
Ocean-currents, 268
Ocean-level, changes in, 231
Ocean Routes, New Publications—
Fast Passages and Best Routes, by W. Allingham, 571
Oceanic Circulation, New Publications—
Specific Gravities and, by A. Buchan, 683
Oceanic water in the North Sea, 258
Oceans, New Publications—
Note sur l'histoire des océans, par M. Suess, 338
Octodontidæ of Africa, 285
Odoric, Friar, Island of Dondin of, 659
Ogowé river and delta, Miss Kingsley's Travels on the, 95
Ohlin, A., Nagra anteckningar . . . i Norra Ishafvet (New Publications), 447
Oliver, Capt. P., French Progress in the Western Soudan (New Publications), 214
————————, The African Pioneers (New Publications), 331

Olsen, O. T., The Fisherman's Nautical Almanac, etc. (New Publications), 224
Oman, Journal of an Excursion in, by Col. S. B Miles, 522 *et seq.*
Ontake Peak, Japanese Alps, 144
Ontario, Western, Mr. McInnes' work in, 413
Oporto, New Publications—
Relatorio . . . da Associaçao Commercial do Porto, by A. da F. Menéres, 439
Oppel, A., Die Zahl der Weissen im tropischen Amerika (New Publications), 217
———, Übersichten der Wertschaftsgeographie (New Publications), 683
Oppenheim, Freiherr v., Journey from Damascus to Bagdad, 548, 658
———, Routenkarte einer Reise von Damaskus nach Bagdad (New Maps), 687
Ordnance Survey, Geographical Description of the British Islands, based on the, by Dr H. R. Mill, 345 *et seq.*
Ordnance Survey Maps (New Maps), 120, 225, 341, 449, 572, 686
Oritæ, ancient tribe, 389
Orleans, Prince Henry of, Du Tonkin au Yunnan (New Publications), 212
———, Journey from the Mekong to Assam, 93, 199, 300, 675
Ossat, Angelis d', Storia fisica dell Agro-Romana (New Publications), 561
Ostrup, J., Historisk-topografiske . . . den Syriske orken (New Publications), 678
O'Sullivan, Mr., explorations in Canada, 315
Ottawa district, geological survey of, 413
———, fertile region north of, 315
Oudemans, J., Longitude de Batavia (New Publications), 330
Ouseley, Sir W., on the island of Kais, 645, 648

P

Pacific, Deep Soundings in the, obtained by Commander Balfour, 318
———, South, Niuafou Island in the, 65 *et seq.*
Pacific, New Maps—
Pilot Charts of the North Pacific, 124, 228, 452
Stiller Ozean, Ein Atlas von 31 Karten, Herausgegeben von Dr. Neumayer, 688
Pacific, New Publications—
Parts of the Pacific, 336
Pacific Coast, New Publications—
Topography of the, by J. S. Diller, 216
Pahde, Dr, Erforschung des Kongo-Systems (New Publications), 113
Paiva, A. de, Expediçao ao Bihé (New Publications), 214
Palatinate, New Publications—
Die bayerische Pfalz, von Dr. A. Geistbeck, 676
Palaung tribe, 596
Palestine, New Publications—
Archæological Researches in, 1873-74, by C. Clermont-Ganneau, 678
Palmer's land, Antarctic, 623
Paloczy, Prof, Prof. L. v. Lóczy (New Publications), 339
Pamir Boundary Commission, route and geographical work of, 91
———— Delimitation, Preliminary Report, etc., by Col. Holdich (New Publications), 441
Pamir plateau, 462
Panama Canal Route, by R. T. Hill (New Publications), 445
Panckow, H., Die Bevölkerung Formosas (New Publications), 330
Pando, Col., exploration of the Madre de Dios, 187
Pandomanagai, dwarf race, 390
Pangani, Reisebriefe . . . am, von G. Meinecke (New Publications), 442
Pangong lakes, Tibet, 477
Panjgur, topography of, 670
Panjkora river, 43
Paraguay and Bolivia frontier, Dr. Polakowsky on the, 205
Paraguay, New Publications—
Bureau of American Republics, Bulletin of, 681
Nueva Geografia Universal, por E. Reclus; Prólogo, etc., por R. de Olascoaga, 565
Parallaxes in Declination, Diagram for determining the, by Major S. Grant, 649
Paris Geographical Society, Awards of, 664
Parsis of Persia, 28, 29, 171
Partsch, Dr, 'Silesia.' Review of, 417
Pasquier, L. du, Glaciers et periodé glaciaire (New Publications), 567
Passarge, Dr S., Reiseroute der Expedition des Deutschen Kamerunconmités (New Maps), 451
————, Adamaua, Review of, 272
Patent Laws of all Countries, Gleanings from, by W. L. Wise (New Publications), 685
Patkoi range, expeditions across the, 202
Paulet island, Antarctic, 697, 629, 635
Paulitschke, Dr., Die heutige Lage der Italiener in Abessinien (New Publications), 442
Paulitschke, P., Der sechste internationale geographische Congress zu London (New Publications), 685
Paulsen, A., Effet de l'humidité, etc., sur l'aurore boréale (New Publications), 448
Payer, J von, letter from, on his map of Franz Josef Land, 105
Payer, R., Naturstudien über das östliche Peru (New Publications), 217
Paz, Dr Ramon, exploration of the Madre de Dios, 188
————, De Riberalta al Inambari (New Publications), 217

Peale, A. C., Natural Mineral Waters of the United States (New Publications), 114
Pearsall, H. D., The Nile Reservoirs (New Publications), 214
Peary's Arctic Journey, New Publications—
Det Arktiske problem og de to Peary-expeditioner, by E. Astrup, 117
Peek, C. E., Meteorological Observations for 1894, Rousdon Observatory (New Publications), 110
Peer's Gill ravine, Lakeland, 620
Peipus lake, M. Spindler's observations on, 655
Pelagosa, New Publications—
Die Inselgruppe Pelagosa, von M. Grollei, 326
Peloponnes, New Maps—
Vegetations-Karte des, von Dr. Philippson, 226
Peloponnes, New Publications—
Vegetationskarte des, von Dr. Philippson, 211
Peloponnesus, vegetation of the, Dr. Philippson on, 426
Penck, Prof. A., Die Eisch (New Publications), 109
Pendulums, horizontal, records of, 252
————, Dr. Rebeur-Paschwitz on, 219
Penguins of the Antarctic, 518
Pennine chain, origin of the, 604
Pennsylvanian Forests, by Dr. Rothrock (New Publications), 216
Penzler, J., Geographisch-statistisches Lexikon über die Erdteile (New Publications), 684
Perceval, Sir W. B., Remarks on "First Crossing of the Southern Alps of New Zealand," 500
Pereira, J. E., A Industria agraria (New Publications), 109
Periodicals of 1894, Index to the, by Miss Hetherington (New Publications), 223
Persia, Journeys in (1890–91), by Capt. Vaughan, 24 *et seq.*, 163 *et seq.*
Persia, New Publications—
Mission Scientifique en Perse, par J. de Morgan, 112, 331
Persian Gulf, Ancient Trading Centres of the, by Capt. A. Stiffe, 644
Peru, New Maps—
Mapa del Peru, A. Raimondi, 121
Peru, New Publications—
Beobachtungen und Studien, etc., von G. W. Middendorf, 335
Biblioteca Peruana, 570
Bureau of the American Republics, Bulletin No. 69., 335
Coast Desert of, by A. F. Scats, 217, 445
Der Amazonas, Wanderbilder aus Peru, etc., von D. von Schütz-Holzhausen, 335
Naturstudien über das östliche Peru, von R. Payer, 217
Peruvian Expedition to the Madre de Dios, 189
Peters, Dr. C., Aequatorial- und Süd-Afrika nach einer Darstellung von 1719 (New Publications), 214; note on, 202
Petersen, J., Die Erforschung des Dirk Gerritsz-Archipel (New Publications), 447
Petherick, E. A., The Torch and Colonial Book Circular (New Publications), 223
Petroff, Lieut.-Gen., expedition in Siberia, 94
Pettersson, Prof. O., surveys in the North Sea, 256
Pfeil, J. Graf von, Der Ochsenwagen in Ostafrika (New Publications), 213
Philip, G., Eight small historical globes (New Maps), 343
————, Special Map of British Guiana (New Maps), 342
Philippi, Dr. R. A., Bemerkungen . . . Verschiedenheit zwischen Patagonien and Chile (New Publications), 680
Philippine Islands, New Publications—
Estudios para una Nosologia Filipina, por E. M. Barcones, 112
Philippson, Dr. A., Die neueren Forschungen . . . den Bau der Erdkruste (New Publications), 220
————————, on the Vegetation of the Peloponnesus, 426
————————, Reisen . . . in Nord-Griechenland (New Publications), 439
————————, Vegetations-Karte des Peloponnes (New Maps), 226
————————, Zur Vegetationskarte des Peloponnes (New Publications), 211
Phillipps-Wolley, Clive, Big Game Shooting (New Publications), 224
Phillips, W., Climate and Health of the United States (New Publications), 216
Phœnician Characters from Sumatra in the Pitt-Rivers Museum (New Publications), 212
———————— in Sumatra, 659
Photographie en océanographie, par M. Thoulet (New Publications), 337
Photographs—
Asia Minor, North-West, by Messrs. Munro, Anderson, and Anthony, 344
Holub, Dr. Emil, Südafrikanische Ausstellung, 124
New Zealand, Southern Alps of, by E. FitzGerald, 576
Norway, by Capt. Mockler-Ferryman, 344
St. Helena, by Col. Swinton, 688
Spitzbergen, by Mr. Corbett and Lieut. Drummond, 576
Photography, Application of, to Topographic Surveying, by G. Heimbrod (New Publications), 567
Phrygia, Prof. Ramsay's work on, review by Sir C. W. Wilson, 190
Phrygie, En, par M. Radet (New Publications), 329

Physiography, Major Powell on, 319
Physiography, by J. W. Redway (New Publications), 338
Piaggia, Carlo, In Memoria di, by F. Bonola Bey (New Publications), 222
Pickering, W. A., The Straits Settlements (New Publications), 331, 678
Pike's Expeditions to Headwaters of the Mississippi, etc, edited by E. Cones (New Publications), 444
Pilcher, Mr., on the Shan people, 591
Pilcomayo river, hydrographical conditions of, 84; shallowness of, 87; swamp on, 88, 89
————, Journeys and Explorations on the, by Lieut. Storm, 82
Pilcomayo, New Publications—
El Rio Pilcomayo y el Chaco Boreal, por O. J. Storm, 334
Pinnacle mountain, Canadian Rockies, 53
Pir-Hajat, Persia, 40
Place-Names, New Publications—
Irrégularités orthographiques des noms de lieux, par M Barbier, 222
Ueber die Schreibweise von Ortsnamen, von P Staudinger, 222
Plant Distribution, Some Curious Facts in, by W. Botting Hemsley (New Publications), 338
Plants, New Publications—
Aufgaben der Pflanzengeographie, von A. F. Schimper, 683
Les plantes de la région alpine, etc., par G. Bonnier, 118
Select Extra-Tropical Plants, etc., by Baron von Mueller, 221
Plarr, V. G., Men and Women of the Time (New Publications), 119
Platter, J. C., Schlösser und Burgen in Tirol (New Publications), 107
Platz, E., Studienfahrten im Gebiete der Vomperkette des Karwendelgebirges (New Publications), 107
Playfair, Sir Lambert, Handbook for Travellers in Algeria and Tunis (New Publications), 213
Pleyte, C. M., De Verkenning der Bataklanden (New Publications), 331
Ploix, Ch., par H Cordier (New Publications), 223
Plumandon, J., Variations de la vitesse des vents, etc (New Publications), 220
Polakowsky, Dr, Die Grenze zwischen Mexico und Guatemala (New Publications), 115
————. Die Zustande auf der Oster-Insel (New Publications), 217
————, on the Bolivia-Paraguay Frontier, 205
Polar Expedition, New Publications—
Forslag till polarfard met luftballong, af S. A. Andrée, 567
Nagra skildringar fran den Wellmanska, af H. Wisttält, 567
Polar streams, 265
Polarforschung, Der gegenwärtige Standpunkt der, von Dr. E. von Drygalski (New Publications), 337
Pomba, C., L'Aspect physique de l'Italie, relief à surface convexe (New Publications), 108
Pomian, A. H. de, Dahome, land och folk (New Publications), 563
Pontine Marshes, The, by F. von Donat (New Publications), 439
Porena, Prof, Un cartografo Italiano (New Publications), 221
Portugal em Africa, Padroado de, by Rev. de Himeria (New Publications), 443
Portugal, Proposed Vasco da Gama Celebration in, 103
Portugal, New Publications—
A Industria agraria, por J. Esteves Pereira, 109
Portuguese discovery of the Moluccas, 365
Portuguese knowledge of Africa in 16th and 17th centuries, 202
Poskin, Dr. A., Climatologie du Congo (New Publications), 332
Poso Lake, Celebes, 205
Powell, B. Baden, A Trip Heavenward (New Publications), 119
Powell, Major, on physiography, 319
Preller, Dr. du Riche, on Glaciation, etc, of subalpine Switzerland, 655
Price, Rev. F. M., Notes on Ruk and the Mortlock Islands (New Publications), 116
Prielmayer, M. v., Die Granatspitzgruppe in den Hohen Tauern (New Publications), 106
Princesse-Alice, Sur la deuxième campagne scientifique de la, par le Prince de Monaco (New Publications), 220
Prince's Island, fauna of, 283
Privat-Deschanel, P., La fixation des dunes au Sahara (New Publications), 443
Probyn, L. C., Gold . . . of the World (New Publications), 340
Prussia, New Publications—
Quer durch Preussisch-Litauen, von D. F. Tetsner, 676
Prutz, H, Gustav Hirschfeld (New Publications), 222
Pteropus of Madagascar, 288
Ptolemies, The Empire of the, by J. P. Mahaffy (New Publications), 332
Ptolemy, Claudius, and his Works, by W. T. Lynn (New Publications), 569
Puelo, Rio, Die Erforschung des, von Dr. Steffen (New Publications), 115; note on, 101
Punjab, New Publications—
Gazetteer of the Sialkot District, by Capt Dunlop Smith, 678
Hill Life in the Afghan and Hindu Highlands of the, by F. St. J. Gore, 330
Irrigation, by Sir J. Lyall, 441
Report on Administration of the Punjab and Dependencies, 563
Purari River, Discovery of the, by T. Bevan (New Publications), 218

Pyrenees, New Publications—
Los ferro-carriles del Pirineo, por Jiménez y Lluesma, 677
Recherches, etc., dans les Pyrénées centrales, par E. Belloc, 109
Sur l'étendue des glaciers des Pyrénées, par M. Schrader, 109

Q.

Quebec, province of, Dr. R. Bell's work in, 413
Quebec, New Publications—
Reports of the Commissioner of Crown Lands, 444
Queensland, New Publications—
Annual Progress Report of the Geological Survey for 1894.. 116
Report on the Leichhardt Gold Field, etc., by W. H. Rands, 218
Travel and Adventure in Northern Queensland, by A. C. Bicknell, 336
Quevedo, S. A. F., Notas Arqueológicas . . . objeto de arte indigena (New Publications), 444

R.

Races Jaunes, Considérations générales sur les, by Dr. Hamy (New Publications), 221
Radde, Dr., and E. Koenig, Der Nordfuss des Dagestan (New Publications), 327
———, Besuch auf Buton and Sud-Celebes (New Publications), 563
———, Eine Woche in Ceylon (New Publications), 562
———, Karte des nordöstlichen Kaukasus (New Maps), 225
Radet, M., En Phrygie (New Publications), 329
Radmore, John R., honour to, 556
Rafaï, le sultan, Deux années . . . chez, par Ch. de la Kéthulle (New Publications), 331
Raimondi, A., Mapa del Peru (New Maps), 121
Rainaud, M. A., La Pentapole cyrénéene et la colonisation (New Publications), 113
Rains, New Publications—
How Nature Regulates Rains, by R. L. Fulton, 683
Rainy Lake Gold Region, Report on the, by Winchell and Grant (New Publications), 334
Raml, Wadi, Tripoli, 151
Ramsay, Prof., Work on Phrygia, Review by Sir C. W. Wilson, 190
Rançon, Dr. A., La Flore utile du Bassin de la Gambie (New Publications), 564
Rand, McNally and Co., Indexed Pocket Maps of British Columbia and Quebec (New Maps), 451
———, Indexed Pocket Maps of the United States (New Maps), 451
Rands, W. H., Report on the Leichhardt Gold Field, etc., in Queensland (New Publications), 218
Raritan Bay and the Delaware, Canal between, 554
Rasak, Makran, 402, 403
Rask, ancient town of, 671, 672
Raskan-darya, Central Asia, 197
Ratzel, F., The History of Mankind (New Publications), 118
Ravenstein, E. G., remarks on "Proposed Geographical Description of the British Islands," 359
Raverty, Major, "Notes on Afghanistan," 547
Rawalpindi District, Gazetteer of the (New Publications), 441
Rawlinson, Sir H., by M. Paul Chaix (New Publications), 119
———, Notice sur, by Henri Cordier (New Publications), 119
Ray, S. H., Texts in the Languages of the Bismarck Archipelago (New Publications), 218
Rebeur-Paschwitz, Dr., Horizontalpendel-Beobachtungen (New Publications), 219
———, Vorschläge zur Errichtung . . . Erdbeben-Stationen (New Publications), 220
Réclus, E., Projet de construction d'un Globe Terrestre à l'échelle du Centmillième (New Publications), 117
——— and Olascoaga, Paraguay (New Publications), 565
Red Sea, New Publications—
Currents in the, by Capt. Hood, 221
Redway, J. W., What is Physiography? (New Publications), 338
Reichard, P., Zur Frage der Austrocknung Afrikas (New Publications), 112
Reiche, Dr., Die Thermen von Chillan in Chile (New Publications), 335
Rein, Prof. J. J., Fortentwicklung . . . des japanischen Kunstgewerbes (New Publications), 441
Reina, V., L'attrazione locale nella Specola geodetica di S. Pietro in Vincoli (New Publications), 219
Reindorf, C. C., History of Gold Coast and Asante (New Publications), 564
Reinhertz, Dr. C., Die Schätzungsgenauigkeit an Maassstäben (New Publications), 447
Rejang, Phœnician characters in, 659
Renaud, G., Les Travaux publics et les Chemins de fer au Tonkin (New Publications), 111
Rendle and Levat, Report on Solfataras . . . of Vanua Lava (New Publications), 566
Réunion Island, Fauna of, 284
Reusch, H., Folk og natur i Finmarken (New Publications), 328
———, The Varangerfjord Region and the Forthcoming Solar Eclipse (New Publications), 439

Reykjanes, New Publications—
Dr. Thoroddsen's Forschungen auf Reykjanes, 328
Reynolds-Ball, E. A., Mediterranean Winter Resorts (New Publications), 685
Rey-Pailhade, J. de, Le temps décimal (New Publications), 117
Rhode, J. J., Argentisch-chilenischen Grenzstreit (New Publications), 680
Riban, Ch., La Tunisie, Histoire de la Colonisation (New Publications), 215
Ribbe, Carl, Reisen in der Südsee, von Dr. Schneider (New Publications), 330
Ricchieri, Prof., VI. Congresso Geografico Internazionale di Londra (New Publications), 341
Richards, Admiral Sir G. H., Report of Navigation of River Mersey (New Publications), 561
Richter, J., Der Streit um die Mosquito-Küste (New Publications), 445
Rickmers, W. Rickmer, Ararat (New Publications), 110
Riesengebirge, New Publications—
Hohenbestimmungen . . . im Riesengebirge, von Dr. A. Galle, 676
Rig-i-Chichagun, Persia, 33
Riley, F. L., Colonial Origins of New England Senates (New Publications), 679
Rinds of Baluchistan, 391, 392
Ripol, J., Calcul rigoureux du point à la mer par deux hauteurs quelconques (New Publications), 337
Ritters geographisch-statistisches Lexikon, von J. Penzler (New Publications), 684
Rivers, ancient origin of, 622
Riviera, The, by Ch. Lenthéric, translated by Dr. West (New Publications), 212
Riviere, Capt., death of, 599
Robinson, Rev. C. H., Hausaland; or, Fifteen Hundred Miles through Central Soudan (New Publications), 215, 443
Robinson, Sir W., Western Australia (New Publications), 116
Roborovsky, Capt., expedition to Tibet, 94
Rock structure in Lakeland, 612
Rocks, An Introduction to the Study of (New Publications), 448
Rocky Mountains, Canadian, 49; history and geology, 52; glaciers, 56; flora and fauna, 58, 60; meteorology, 61; snowfall of, 62; forest fires, 62; surveys, 63
Rodents of the Ethiopian Region, 285
Rodriguez island, fauna of, 284
Rodway, J., Old Boundary of Essequibo (New Publications), 565
————, West Indies and Spanish Main (New Publications), 566
Rogers, A., The Province of Gujarát (New Publications), 677
Rosén, P. G., Telegraphische Langenbestimmungen zwischen Lund, Göteborg (New Publications), 109
————, Untersuchungen . . . der Grube Sala (New Publications), 337
Rosthorn, A. von, journey in Western China, 201
Rosthwaite alluvial plain, 616
Rotation of the Earth, New Publications—
M. Andrade's works on, 219
M. Coret's work on, 219
Roth, H. Ling, on the name of Dyak (Dayak), 432
Rothrock, Dr., Our Pennsylvanian Forests (New Publications), 216
Rouire, Dr., La Colonie portugaise d'Angola (New Publications), 215
Rousdon Observatory, Devon, Meteorological Observations for 1894, by C. E. Peek (New Publications), 110
Rousselet, L., Nouveau Dictionnaire de Géographie Universelle (New Publications), 684
Roux, E., Lettre sur le Yunnan (New Publications), 329
Roy, J. E., Le baron de Lahontan (New Publications), 222
Royal Geographical Society—
Afternoon Technical Meetings, 106, 437, 559
Educational lectures by Mr. Mackinder, 91
Educational prizes, award of, 425, 544
Honours to the President of, 90, 654
Legacy from Mr. Chandless to, 655
Medals, royal, and other awards for 1896..654
Meetings of, Session 1895–96..105, 106, 211, 325, 436, 437, 559, 560, 675
Ruapehu, New Publications—
Early Ascent of, by Th. Allison, 116
Ruapehu: Retrospect and Prospect, by H. Hill, 116
Rubel, O., Die Niederschlagsverhältnisse im Ober-Elsass (New Publications), 327
Rud-i-Ax-i-Rustam river, Persia, 26
Rudok, Tibet, 477
Rüge, Dr., Das unbekannte Südland (New Publications), 221, 337
Ruk and the Mortlock Islands, Notes on, by Rev. F. M. Price (New Publications), 116
Rukwa, Lake, Mr. Nutt's journey to, 427
Rumpelly, R., J. Wolff, and T. N. Dale, Geology of the Green Mountains in Massachusetts (New Publications), 216
Rungwe volcano, Central Africa, 370
Rusden, G. W., History of New Zealand (New Publications), 446
Ruspoli, E., by Prof. E. Millosevich (New Publications), 223
Russell, I. C., Influence of débris on the flow of glaciers (New Publications), 220
————, Reports on the Conference of Geography at Chicago, 434
Russia, New Publications—
Bibliothèque Géologique de la Russie, 1894, by S. Nikitin, 676
Die Entstehung der Limane Südrusslands, von N. Sokolow, 677

Russia, New Publications—*continued*.
Die Seen der Gouvernements Twer, Pskow und Smolensk, von Krahmer, 109
Distribution du vent . . . dans l'Empire Russe, par J. Kiersnowsky, 677
La colonisation russe contemporaine le long de la Volga, par M. d'Almeida, 109
L'écorce terrestre dans la Russie d'Europe, par M. Karpinsky, 328
Russia in Europe, by Hon. G. Hubbard, 439
Russian Geographical Society, Jubilee of, 310
Ruwenzori mountain, 660
Ryder, C., Isforholdene i Nordhavet (New Publications), 447
Ryder, M. C., Observations . . . dans le Scoresby Sound (New Publications), 682

S.

Sacken, C. R. Osten. The Bugonia-Lore of the Ancients (New Publications), 224
St. Helena island, fauna of, 283
————, photographs of, by Colonel Swinton, 688
St. Helena, New Publications—
Die zoogeographische Stellung der Insel St. Helena, von Dr. W. Kobelt, 679
Notes on Fisheries, etc, of, 215
St. John valley, Lakeland, 616
St. Lawrence, New Publications—
Pleistocene Marine Shore-line on South Side of, by R. Chalmers, 679
Saint-Martin and Rousselet, Dictionnaire de Géographie, Note on, 415
St. Thomas island, fauna of, 283
St. Thomé, A provincia de, A. de Castilho (New Publications), 443
Sahara, New Publications—
De Dakar au Cap Juby, 443
Dunes au Sahara, par M. Privat-Deschanel, 443
Saharan Subregion of the Geography of Mammals, 293
Sakhalin, peat-formation in, 423; races of, 424
————, The Island of, by Prof. von Krasnow, 422
Sakkara tribe, 428
Sakkelionos, Greek Bibliography (New Publications), 223
Salaga, Niger basin, 97
Salamander, giant, of Japan, 137
Salt town, 549
Salonga river, Central Africa, 203
Salt deserts of Persia, 165–167
Salt lake, Persia, 169, 170
Salt-making in Central Africa, 373
Salvador, New Publications—
Bureau of American Republics, Bulletin of, 681
Salwin, source of the, 398
————, affluents of the, 580
————, width and depth of the, 582
Salwin to Khamti, Prince Henry of Orleans' route from, 304
Samnan, height of, 166
Samoa, New Publications—
Samoa die Perle der Südsee, von O. Ehlers, 336
San Carlos, New Publications—
Topográfico y Geologico de, 444
San Luis, New Publications—
Excursion en la Provincia de, por Dr. Valentin, 445
Sana Kachins, N. E. India, 93
Sanchez, A., La Cornoide (New Publications), 567
Sandhills in Tibet, 457
Sandhills of Persia, 39, 40
Sanga basin, M. Wauters' map of the, 552
Sanga, New Publications—
La Haute-Sangha, par Ed. Ponel, 114
La Rivière Sanga, par A. J. Wauters, 442
Sango village, position of, 429
Santals, New Publications—
Om Santalfolket, etc., af E Heuman, 563
Santo Domingo, New Publications—
Bureau of American Republics, Bulletin of, 681
Sa On, subterranean river at, 581
Sapper, Dr., Beiträge zur Ethnographie von Südost-Mexiko und Britisch-Honduras (New Publications), 115
Sarasin, F. and P., explorations in Celebes, 205
————————, Reiseberichte aus Celebes (New Publications), 212, 678
Saurin, J., La colonisation française en Tunisie (New Publications), 215
Saxony, New Publications—
Waldungen des Königreichs Sachsen, von H. Gebauer, 328
Sayce, Rev. A. H., The Egypt of the Hebrews and Herodotus (New Publications), 213
Schimper, A. F., Aufgaben der Pflanzengeographie (New Publications), 683
Schiötz, O. E., Resultate in dem südlichsten Theile Norwegens ausgeführten Pendelbeobachtungen (New Publications), 109
Schirmer, H., Les Traites de Partage de 1894 en Afrique Centrale (New Publications), 442
Schizocodon soldanelloides, 136
Schmidel, Ulrich, por B. Mitre (New Publications), 569
Schmidt, Dr. A., Erdmagnetismus und Erdgestalt (New Publications), 338
————————, Vertheilung des erdmagnetischen, etc. (New Publications), 449
Schmidt, Prof. Vald, Hvor laa det gamle Gosen (New Publications), 563
Schmitt, R. H., Colonisations project der Freiländer (New Publications), 571
Schneider, A., Stadtumfange in Altertum und Gegenwart (New Publications), 339
Schneider, Dr., Carl Ribbes Reisen in der Südsee (New Publications), 339

Schomburgk, Sir Robert, boundaries laid by, 280, 309
————————, explorations in British Guiana, 101
Schools, Secondary, Geography in, 208
Schott, Dr, Hydrographie . . . der Ostsee (New Publications), 448
Schrader, F., Atlas de Géographie Historique (New Maps), 228, 574
————, Atlas Universel de Géographie (New Maps), 343
————, L'Année Cartographique (New Maps), 342
————, Nouvel instrument servant au trace direct, etc. (New Publications), 219
————, Sur l'étendue des glaciers des Pyrénées (New Publications), 109
Schulatlanten, Spezialkärtchen in useren, von Dr. Hözel (New Publications), 684
Schütz-Holzhausen, D. von, Der Amazonas (New Publications), 335
Schwabe, Dr., Bericht über die Gesundheitsverhältnisse der Marshall Inseln (New Publications), 218
Schwarzburg-Sondershausen, Die Wald- und Wasserverhältnisse des Fürstentums, von Dr. Toepfer (New Publications), 108
Schweiger-Lerchenfeld, A. v., Die Donau als Volkerweg (New Publications), 327
Schweinfurth, G., Ein altes Heiligtum an den Ufern des Moris (New Publications), 214
————, Die Wiedergeburt Aegyptens (New Publications), 221
Schwere in der Grube Sala, Untersuchungen über die, von P. G. Rosén (New Publications), 337
Schwérer, A, Étude sur la loi des tempêtes (New Publications), 220
Scientific Papers, Catalogue of, by Royal Soc. of London (New Publications), 570
Sclater, Capt, journey from Mombasa to the Victoria Nyanza, 662
Sclater, W. L., The Geography of Mammals. No. IV., 282 *et seq.*, 435
Scordale, Lakeland, 609
Scoresby Sound, New Publications—
Observations . . . dans le Scoresby Sound, by M. C. Ryder, 682
Scotland, New Maps—
The Royal Scottish Geographical Society's Atlas of, by J. G. Bartholomew, 120
Scotland, New Publications—
Archæological Notes on Early Scotland, by W. G. Don, 562
The Frost of 1895 in, by R. C. Mossman, 677
Scott, J. G., Remarks on "The Country of the Shans," 609
Scriven, Capt. G. P. Report on Nicaragua Canal (New Publications), 565
Seals and Whales in the Antarctic, 516, 627
Sears, Major, The Coast Desert of Peru (New Publications), 217, 445
Seebohm, Henry, Obituary of, 103
————, Sir G. Goldie's remarks on the death of, 211
Seeley, Prof, Remarks on "Proposed Geographical Description of the British Islands," 362
Ségou-Sikoro, De Marseille à, par R. Hacquart (New Publications), 214
Seidel, A, Geschichten und Lieder der Afrikaner (New Publications), 678
Seismographs, records of, 251
Seismological Society of Japan, 239
Seismology, value of, 238, 239
Selenoy, G. L., und N. v. Seidlitz, Die Verbreitung der Armenier in der asiatischen Türkei (New Publications), 440
Sella, A., Magnetismo terrestre sul Monte Rosa (New Publications), 449
Semenoff, M, jubilee speech to Russian Geographical Society, 310
Senegal, ports of, 314
Septfonds, Les Chapeaux de Paille de, par J. Gebelin (New Publications), 107
Sernander, R., Studier öfver den Gotländska vegetationens (New Publications), 328
Serrano, F., discovery of the Moluccas, 365
Seychelles Islands, fauna of, 283
Shaahbet el Khel, Tripoli, 156
Shabokoma, Lake, Canada, 315
Shahpur, Persia, 175
Shan Hills, The, by Col. Woodthorpe (New Publications), 441
Shans, Country of the, by Colonel Woodthorpe, 577 *et seq.*
Shan States, extent of, 578; description of country, 578; rivers, 578, 579; subterranean rivers, 581; animals of, 586; climate, 587; mists in the valleys in the, 587; people of the, 591, 596, 691; cultivation in the, 592
Shari, swamps of the, 271
Sharpe, Alfred, The Geography and Resources of British Central Africa, 366 *et seq.*
Shillingford, F. A., Changes in the Course of the Kusi River, etc. (New Publications), 212
Shinano-Hida range, Japan, 148
Shinano plain, archæological remains on, 148
Shinko river, Congo basin, 203
Ship Canal at the Iron Gates on the Danube, 544
Ship Canals in the United States, Projected, Dr. Deckert's account of, 553
Shir-Kuh, Persia, 30
Shirahoneyu hot springs, Japan, 148
Shire highlands, coffee-planting of the, 374; labour supply in the, 376; colonization of the, 380
Shiré river, changes of level of, 368
Shoals, Isolated, Improbability of finding, by G. W. Littlehales (New Publications), 448
Shunserab river, Kashgar range, 196

Sia and Tusayan Snake Ceremonials, by J. W. Fewkes (New Publications), 118
Siam and Indo-China, Boundary Treaties in, 297
Siam, New Publications—
Le Siam Ancien, Archéologie, etc., by L. Fournereau, 112
Notes on a Journey to . . . Siam, by H. Warington Smyth, 331
Siam: a geographical summary, by Mrs. Grindrod, 213
Sibal, Oman, 529
Siberia, Lieut.-Gen. Petroff's expedition in, 94
———, M. Obrucheff's expedition in, 95
Siberia, New Publications—
Der Kreis Surgut in West-Sibirien, von P. von Stenin, 331
Siberian Railway, progress of the, 311
——— rivers, mouths of the, explorations in 1895..545
Sibree and Baron, Revs., Antananarivo Annual and Madagascar Magazine (New Publications), 443
Sicily, New Publications—
La Sicile, par M. G. Vuillier, 328
Sieger, Dr., Karstformen der Gletscher (New Publications), 220
Sievers, Dr. W., Amerika, Eine allgemeine Landeskunde Herausgegeben von (New Publications), 215
———————, Australien und Ozeanien (New Publications), 335
———————, Die Grenzen Venezuelas (New Publications), 335, 446
———————, Zweite Reise in Venezuela (New Publications), 446
Sigiriya, New Publications—
Report of the Archæological Survey, by H. C. P. Bell, 552
Silesia, by Dr. Partsch, Review of, 417
Silesia, New Publications—
Das mittelschlesische, etc, von Dr. R. Leonhard und Dr. Volz
Silk cultivation in Japan, 139
Simon, Lieut., journey up the Mekong, 583, 586
Simons, F., Carta Corográfica del Departemento de Bolivar and Magdalena (New Maps), 228
Sinclair, Sir John, by Archdeacon Sinclair (New Publications), 684
Siouan Tribes of the East, by J. Mooney (New Publications), 216
Sis Salwin States, 590
Sistan, ancient town of, 397
Sitta, Prof. P., La colonizzazione dell' Africa tropicale (New Publications), 333
Slatin Pasha, Conférence faite à la Société Khédiviale de Géographie (New Publications), 214
———————, Fire and Sword in the Sudan (New Publications), 442
Slavery in Central Africa, 381, 409, 412
Smith, Capt., Gazetteer of the Sialkot District (New Publications), 675
Smith, Dr. G., Bishop Heber (New Publications), 119
Smith, G. H., The Theory of the State (New Publications), 685
Smulders, J., Kaart van de Zuid Afrikaansche Republiek (New Maps), 688
Smyth, H. Warington, Notes on a Journey to . . . Siam (New Publications), 331
Socotra, fauna of, 283
Sokaart-Archivets Antike Kaartsamling (New Publications), 119
Sokolow, N., Die Entstehung der Limane Südrusslands (New Publications), 677
Somaliland, Capt. Bottego's new expedition to, 99
Somaliland, New Maps—
Sketch of the Routes in, by Christie, Sparrow, and Mainwaring, 121
Somaliland, New Publications—
A trip in Somali Land, by Capt. Wellby, 113
Die deutschen Bestrebungen an der Somali-Küste, von C. von Bornhaupt, 113
Notizie della spediz one Bottégo, 679
Somaliland, Photographs of, by F. Gillett (New Maps), 452
Somerset, H. S., The Land of the Muskeg (New Publications), 114
Somerville, Lieut., Account of a visit to Niuafóu, South Pacific, 65 *et seq.*
Soudan: *see* Sudan
Soundings, Deep, in the Pacific, obtained by Commander Balfour, 318
Sous Terre, par E. A. Martel (New Publications), 221
Spain, New Publications—
Herbsttage in Andalusien, von G. Wegener, 440
Mission en Espagne, par M. du Dezert, 328
Regiones botánicas de la peninsula iberica, por D. Lázaro e Ibiza, 677
Village Communities in, 109
Spamer's Grosser Hand-Atlas (New Maps), 574
Spanish claims in Guiana, 277, 278
Spears, J. R., The Gold Diggings of Cape Horn (New Publications), 335
Speech, The Expressiveness of, by A. R. Wallace (New Publications), 119
Speleological Society founded by M. Martel, 434
Speleology, New Publications—
Geographie und Höhlenkunde, von F. Kraus, 221
Sous Terre, par E. A. Martel, 221
Spencer, Dr., studies on the Great Lakes and Niagara, 204
———————, The Duration of Niagara Falls and History of the Great Lakes (New Publications), 115
Sperry, L. B., Avalanche Basin, Montana Rockies (New Publications), 444
Spielmann, Dr., Madagascar (New Publications), 443

Spindler, M., observations on Lake Peipus, 655
Spitzbergen, Sir Martin Conway's proposed expedition to, 555
Spitzbergen, New Publications—
En resa till norra Ishafvet, af A. Hamberg, 447
"Kane's" Reise langs Spitsbergens vestkyst af Trygve Heyerdahl, 117
Les Français au Spitzberg, par M. E. T. Hamy, 561
Om Spitsbergen og den Wellmanske polarexpedition af cand. real. H. H. Alme, 117
Spitzbergen, Photographs of, by Mr. Corbett and Lieut. Drummond, 576
Stadtumfänge in Altertum und Gegenwart, von A. Schneider (New Publications), 339
Stair, Rev. J. B., Floatsam and Jetsam from the Great Ocean (New Publications), 218
Stamboul: Old and New, by R. Davey (New Publications), 440
Stampede Pass, Cascade Range, by V. G. Bogue (New Publications), 444
Stanford's Compendium of Geography and Travel, vol. ii., South Africa, by A. H. Keane (New Publications), 113
Stanford's Map of Guiana and Venezuela (New Maps), 342
Stapf, Dr., on the flora of Mount Kinabalu, 431
Stars, New Publications—
Bearings of the Principal Bright Stars, etc., by A. C. Johnson, 447
State, The Theory of the, by G. H. Smith (New Publications), 685
Statistical Year Book of Canada (New Publications), 333
Statistics of Occupation, New Publications—
Zur Technik . . . Angaben, von Dr. Mayr, 569
Statistique, Bulletin de l'Institut International de (New Publications), 224
Staudinger, P., Ueber die Schreibweise von Ortsnamen (New Publications), 222
Steamships, manœuvring powers of, by Blackmore and Colomb (New Publications), 540, 571
Steffen and Krüger, Drs, exploration of the Rio Puelo, Chile, 101
Steffen, Dr., Chile und Argentinien in der patagonischen Kordillere (New Publications), 217
————, Die Erforschung des Rio Puelo (New Publications), 115
Steinbach, Dr., Die Gesundheitsverhältnisse der Marshall Inseln (New Publications), 218
————, The Marshall Islands, 296
Steinhauer, J. S., First lessons in geography (New Publications), 224
Stenberg, E. G., Bidrag till Kännedomen om Fidjuöarnes (New Publications), 682
Stenin, P. von, Der Kreis Surgut in West-Sibirien (New Publications), 331
Stewart, Sir R. C., Remarks on "The Country of the Shans," 600
Stiffe, Capt. A., Ancient Trading Centres of the Persian Gulf, 644
Stone, Sir B., remarks on "Proposed Geographical Description of the British Islands," 358
Storch, Lieut., on the Ethnology of Usambara, 429
Storm, O. J., El Rio Pilcomayo y el Chaco Boreal (New Publications), 331
————, Journeys and Explorations on the Pilcomayo River, 82
Strahan, Aubrey, on the Carboniferous rocks of Lakeland, 603
————, Remarks on "The Waterways of English Lakeland," 623
Straits Settlements, New Publications—
Its Early History, by W. A. Pickering, 331
The Straits Settlements, by W. A. Pickering, 678
Stream-erosion curves in Lakeland, 621
Stream-lines, divergence of, in Lakeland, 619
Stream Measurements, Results of, by F. H. Newell (New Publications), 115
Street, A. H., Return of Wrecks and Casualties in Indian Waters (New Publications), 678
Strike-valleys of Lakeland, 613
Stromö, Færoes, 18
Strozzi, Andrea, by G. Uzielli (New Publications), 119
Stuhlmann, Dr., Ueber die Ulugururberge in Deutsch-Ostafrika (New Publications), 214; note on, 314
Sty Head Tarn, Lakeland, 616, 620
Suaheli, Aus dem Lande der, von G. Meinecke (New Publications), 442
Submarine Cables of the World, by G. Herrle (New Publications), 685
Submarine Peaks, Form of, by G. W. Littlehales (New Publications), 338
Sudan, Central, New State of Belda in the, 313
Sudan, New Maps—
Carta del Teatro della guerra nel Sudan Egiziano, 687
Sudan, New Publications—
Fire and Sword in the, by Slatin Pasha, 442
French Progress in the Western Soudan, by Capt. P. Oliver, 214
Hausaland, by Rev. C. H. Robinson, 443
Le campagne 1892-93 au Soudan français, par M. Archinard, 332
Tripoli et les voies commerciales du Soudan, par J. B. d'Attanoux, 333
Upper Niger and Soudan, by L. Nott, 333
Suderö, coal in, 5
Suess, Prof., Note sur l'histoire des océans (New Publications), 338

Sugar-producing Colonies, Future of our, by J. C. Williams (New Publications), 341
Sulphur springs and baths in the Japanese Alps, 132–134
Sumatra, Batak-Land in, 76 *et seq.*
————. Phœnician characters in, 659
Sumatra, New Publications—
De verplaatsing van eenige Triangulatie-Pilaren in de Residentie Tapanoeli, door J. Muller, 212
Phœnician characters from, 212
Supan, Dr. A., Grundzüge der physischen Erdkunde (New Publications), 221
————, Verteilung der Armenischen Bevölkerung in Türkisch-Armenien, etc. (New Maps), 342
Surveys, New Publications—
Report of U.S. Coast and Geodetic Surveys, 567
Surface Waters of the North Sea, The Movements of the, by H. N. Dickson, 255 *et seq.*
Surrey, New Publications—
Highways, etc., of, by C. Barrett, 328
Survey of India Department, Report on the Operations of the (New Publications), 330
Sutherland, New Publications—
Geology and Scenery of Sutherland, by H. M. Cadell, 561
Sutton, W. J., Report on Mining Section in Alberni District (New Publications), 564
Svinö, circular holes in cliffs of, 4
Swahili slave traders, 409, 412
Sweden, measurements for sea-level in, 234
Sweden, New Publications—
Determinations des éléments magnétiques . . . en Suède, par V. Carlheim-Gyllenskold, 328
Om några genombrottsdalar . . . fjälltraker, af A. G. Högbom, 561
Om sveriges zoologiska hafsstation Kristineberg, af H. Théel, 109
Sverige i utländska Kartverk, af H. Byström, 561
Telegraphische Längenbestimmungen, von P. Rosén, 109
Sweny, Lieut. M., Sketch of Sea Approaches to Mersey (New Publications), 561
Swettenham, F. A., Malay Sketches (New Publications), 330
Swinton, Col., Photographs of the Island of St. Helena, 688
Switzerland, Glaciation and Lake-Basins of Subalpine, Dr. du Riche Preller on, 655
Switzerland, New Maps—
Topographischer Atlas der Schweiz, 226
Switzerland, New Publications—
Annuaire Statistique de la Suisse, 440
Syria, New Publications—
Historisk-topografiske, etc., af J. Ostrup, 678
Szu-chuan province, Mr. von Rosthorn's journey in, 201

T.

Tabaran, ancient town of, 671
Tabbas desert and town, Persia, 38
Tafilet, by W. B. Harris (New Publications), 214; review of, 274
Taft, Persia, 29
Takalekajo mountains, Celebes, 205
Takla-Makan-Wüste, durch die, von Dr. Sven Hedin (New Publications), 110
Talamanca, New Publications—
Exploracion de Talamanca, por W. Gabb, 217
Talcahuano, El Puerto de, por A. Fagalde (New Publications), 115
Talifu, Prince Henry of Orleans' journey from, 300
Tamai, K., Eine japanische Reise um die Welt (New Publications), 225
Tanaka, Dr. S., Geschichtliche Verkehr in Japans mit dem Auslande (New Publications), 563
Tang Aw on the Mekong, 583
Tanganyika Lake, Organisms of Marine Type in, 663
Tanganyika, meaning of word, 378
Tanganyika-Nyasa plateau, 372
Tarhuna and Gharian, Tripoli, Notes on a Journey in, by H. S. Cowper, 150 *et seq.*
————, lower slope of, 151; plateau, 152, 158; people, 153; tribes, 552
Tarhunis, Arab race, 153, 154
Tarnovski, Capt. G. V., Transcaspia and Khurasan (New Publications), 213
Tarr, R. S., Elementary Physical Geography (New Publications), 118
Tash-kurgan, earthquake shocks at, 196
Tasman, A. J., his life and voyages, by J. B. Walker (New Publications), 684
Tasman valley, New Zealand, 485
Tateyama hot springs, 130–132, 148
Taunggyi station, Shan States, 580
Taurong river, 200
Tay, Estuary of the, by D. Cunningham (New Publications), 110
Tay Firth, Antarctic, 634
Téglás, M. G., Neue Beiträge zur den Felsen-Inschriften der Katarakte in der untern Donau (New Publications), 107
Teheran, height of, 165
Tehuantepec Ship Railway, by E. L. Corthell (New Publications), 444
Tele Lake, Upper Niger, 99
Tembé, New Publications—
Une course au Tembé, par Henri Junod, 564
Tembi Kundu, position of, 313
Temperature in the Southern Hemisphere, 556
———————— in the Great Southern Ocean, 539
———————— of the air, balloon observations, 542

Tempêtes, Étude sur la loi des, par A. Schwérer (New Publications), 220
Temple, A. G., England's History as pictured by Famous Painters (New Publications), 677
Temple, Mount, Canadian Rockies, 50, 64
Teneriffe, New Publications—
Die Insel Tenerife, von Dr. H. Meyer, 113, 331
Tengri-Nor Lake, Tibet, 467
Terek pass, Tibet, 453
Tergelat, Wadi, 551
Termites, New Publications—
El rol de los Termitos, etc., por J. Koslowsky, 449
Terrestrial Magnetism, New Publications—
Die magnetische Declination, etc., von Dr. Weyer, 449
Loi de la distribution du magnétisme, by M. de Tillo, 219
Magnetismo terrestre sul Monte Rosa, by A. Sella, 449
On the Distribution . . . of Terrestrial Magnetism, by L. A. Bauer, 219
Sur la construction de nouvelles Cartes magnétiques, etc., by M. Bernardières, 219
The Earth a Magnetic Shell, by F. Bigelow, 219
Vertheilung der erdmagnetischen, etc., von Dr. Schmidt, 449
Terrestrial Refraction and Mirage, by Major MacMahon (New Publications), 218
Tetsner, Dr. F., Quer durch Preussische-Litauen (New Publications), 676
————, Zur Besiedelung und Germanisierung Deutsch-Litauens (New Publications), 327
Texas, New Publications—
The Soils of, by E. T. Dumble, 334
Thaika, Wadi, Oman, 532
Theel, H., Om sveriges zoologiska hafsstation Kristineberg (New Publications), 109
Theoretical Geography, letter from Prof. W. M. Davis on, 557
Thirlmere valley, 616
Thiselton-Dyer, Mr., remarks on "A Journey across Tibet," 479
Thomas, E., Le Bokaha, quelques notes sur le pays (New Publications), 564
Thomas, T. P., The City Government of Baltimore (New Publications), 444
Thompson, Prof., remarks on biological collections brought from the Antarctic, 518
Thomson, Joseph, by J. G. Bartholomew (New Publications), 119
————, von W. Wolkenhauer (New Publications), 339
Thoroddsen, Dr., Forschungen auf Reykjanes (New Publications), 328
————, Fra det nordöstlige Island (New Publications), 561
Thoroddsen, Dr., Geologische Karte des Südöstlichen Island (New Maps), 226
Thorshavn, Færoes, 8
Thoulet, Prof. J., De l'emploi de la photographie en océanographie (New Publications), 337
Thuringia, New Publications—
Ausrottung der Raubtiere im, von L. Gebing, 676
Tiaker-agnil lake, Kashgar range, 196
Tian Shan, MM. Grum Grjimailo's journeys in the Eastern, 656
Tibet, A Journey across, etc., by St. G. R. Littledale, 453 *et seq.*
——, Capt. Roborovsky's expedition to, 94
——, dissication of lakes in, 474
——, flora of, 479
Tibetan Lamaists, 201
——— plateau, 462
Tierra del Fuego, New Publications—
The Gold Diggings of Cape Horn, by J. R. Spears, 335
Tiflis, New Publications—
Temperatur des Erdbodens im Tiflisser Physikalischen Observatorium, 213
Tigris, rafts on the, 659
Tillo, A. de, Loi de la distribution du magnetisme (New Publications), 219
Tilton, J. L., South-western part of the Boston Basin (New Publications), 334
Timbuktu Region, French explorations in the, 98
Timbuktu, New Maps—
Carte topographique, par M. Vuillot, 451
Timbuktu, New Publications—
La région de Timbouctou, par R. Bluzet, 214
Timmerman, J., Standpunkt der physische Geographie (New Publications), 683
Tindholm, Færoes, 17
Tiva river, E. Africa, 409
Tiz, Makran, 395, 396
Toba lake, Batak Land, 77, 78
Todd, C., Meteorological Observations made in S. Australia (New Publications), 682
Toepfer, Dr., Die Wald- und Wasserverhältnisse des Fürstentums Schwarzburg-Sondershausen (New Publications), 108
Togoland, New Maps—
Expedition des Deutschen Togo Komitee's unter Drs. Gruner, Döring, und Lieut. v. Carnap, 451
Togoland, New Publications—
Deutschen Kolonie Togo, von L. Conradt, 443
Meine Reise im Togolande, von Hauptmann Kling, 563
Tongan dominions, Niuafóu island of the, 65
Tonkin au Yunnan, Du, par le Prince Henri d'Orléans (New Publications), 212
Tonkin to Yunnan, Prince Henry of Orleans journey from, 93
Tonkin, New Publications—
Les Travaux publics et les Chemins de fer au Tonkin, par G. Renaud, 111

Topographic Forms, Composite Origin of, by A. P. Brigham (New Publications), 220
Topographie Ancienne, Catalogue de Cartes Anciennes (New Publications), 570
Torch and Colonial Book Circular, by E. A. Petherick (New Publications), 223
Toutée, Capt., expedition on the Niger, 97
———, Par le Dahomey et le Niger moyen au Sahara français (New Publications), 442
Townsend, C. H. T., On the Bio-Geography of Mexico, etc. (New Publications), 333
Trading Centres, Ancient, of the Persian Gulf, by Capt. A. Stiffe, 644
Traill, H. D., Life of Sir J. Franklin (New Publications), 569
Traill, W. H., on the earliest monument to Capt. Cook, 435
Transbaikalien, von Generalmajor z. D. Krahmer (New Publications), 213
Transcaspia and Khurasan, by Capt. G. V. Tarnovski (New Publications), 213
Transcaucasia, Distribution of Armenians in, 312
———, ethnography of, 548
Trans-Siberian Railway, Progress of the, 311
Transvaal, New Maps—
Kaart van de Zuid Afrikaansche Republiek, by J. Smulders, 688
Map of the, and Surrounding Countries, by W. and A. K. Johnston, 342
Southern Goldfields of the, by F. Jeppe, 451
Troye's Map of the, 687
Transvaal, New Publications—
Le Transvaal, Etat politique, etc., par M. Diamanti, 113
Transylvania, New Publications—
Das Jara-Thal and seine Bewohner, by Prof. Czirbusz, 561
Travancore, New Publications—
Report on the Census of, by V. Nagam Aiya, 330
Travellers, Hints to, lectures by professors of Paris Museum, 319
Treaties, New Publications—
Collection of Commercial Treaties . . . between Great Britain and Foreign Powers, by Sir E. Hertslet, 571
Tripoli, Mr. H. S. Cowper's journey in, 551
———, Notes on a Journey in Tarhuna and Gharian, by H. S. Cowper, 150 *et seq.*
Tripoli, New Publications—
Tripoli et les voies commerciales du Soudan, par M. d'Attanoux, 333
Tripp, C., Tobacco Industry of India and Far East (New Publications), 562
Trotter, Colonel J. K., visit to the source of the Niger, 313
Trotter, Coutts, letter from, on the Island of Niuafóu, 210
Troup, J., Industrial and Commercial Development of Japan (New Publications), 678
Troutbeck, Vale of, 611
Troye's Map of the Transvaal (New Maps), 687
Tseku, station of the Tibetan mission, 301
Tsetse Fly-Disease, The, by W. F. Blandford (New Publications), 686
Tubaran, Makran, 404
Tugwell, Bishop, Visit to Bida (New Publications), 443
Tunis, New Publications—
La Colonisation française en Tunisie, par M. Saurin, 215
La Tunisie, Histoire de la Colonisation, par Ch. Riban, 215
Turfan oasis, 657
Turkey in Asia, Cuinet's, Review on, by G. G. Chisholm, 281
Turkey, New Publications—
Eisenbahnen in der Türkei, von W. Heintze, 440
Turum-Pusht, marble quarry at, 171
Twelve Hundred Miles in a Waggon, by Miss A. B. Balfour (New Publications), 332
Tyin, Jebel, 524
——, Wadi, 522, 526, 527
Tyneside Geographical Society, progress of, 103
Tyrol, New Publications—
Der Vompergkette des Karwendelgebirges, von E. Platz, 107
Schlösser und Burgen in Tirol, von J. C. Platter, 107
Tyrrell, Mr., Work east of Lake Winnipeg, 413

U.

Ukambani hills, E. Africa, 662
Ulu district, E. Africa, 407, 411
Ulug-art pass, Kashgar range, 195
Ulugiru District, Dr. Stuhlmann on the, 314
United States, population of the, 194, 195
———, Ship Canals in the, Dr. Deckert's account of, 553
United States, New Maps—
Hydrographic Charts, 124, 228, 452
Indexed County, etc., Guides to the, Rand, McNally & Co.'s, 451
United States, New Publications—
Climate and Health of, by W. Phillips, 216
Colonial Origins of New England Senates, by F. L. Riley, 679
Free Burghs in the United States, by J. H. Blodgett, 564
Geological Atlas of the, by B. Willis, 444
Miscellaneous Statistics of Eleventh Census, 564
Natural Mineral Waters of the, by A. C. Peale, 114
Potable Waters of the Eastern United States, by W. McGee, 216
Public Lands and their Water Supply, by F. H. Newell, 680
Report of Chief of Weather Bureau, 333

United States, New Publications—*contd.*
Results of Stream Measurements, by F. H. Newell, 115
Survey . . . of Indian Territory, by H. Gannett, 565
United States of America, 1765–1865, by E. Channing, 679
Universel, Atlas, de Géographie, par F. Schrader (New Maps), 343
University Extension in Austria: Geography, 91
Uruguay, New Publications—
Bureau of American Republics, Bulletins of, 682
Usambara, Ethnology of, Lieut. Storch's observations on the, 429
Usukuma, New Publications—
Oberflächengestalt und Klima von, von C. W. Werther, 678
Uwemba country, Central Africa, 372
Uzielli, G., Piero di Andrea Strozzi viaggiatore fiorentino (New Publications), 119

V.

Vai Lahi, Niuafóu island, 79
Valderrama, M., La Cuestion de Limited entre Chile i la República Arjentina (New Publications), 217
Valentin, Dr, Excursion efectuada en la Provincia de San Luis (New Publications), 445
Vambéry, H., Bilder aus Chiwa (New Publications), 441
Vancouver Island, New Publications—
Notes on, by A. Begg, 215
Varthema, L., supposed discovery of the Moluccas, 366
Varzuuna, Persia, 169
Vasco da Gama Celebration in Portugal, proposed, 103
Vasco, G., Madagascar: les forêts, le caoutchouc (New Publications), 214
Vasseur et Fournier, MM., L'extension . . . du massif ancien des Maures (New Publications), 439
Vaughan, Capt, Journeys in Persia, 24 *et seq*, 163 *et seq*.
Vaux, M de, Note sur un ouvrage . . . de Maçoudi (New Publications), 684
Vedel, P., On the Growth, etc., of Ice (New Publications), 224
Vegetation of the Peloponnesus, Dr. Philippson on, 426
Velthuyzen, Lieut., explorations in Dutch New Guinea, 432
Venezuela, New Publications—
Controversy between Venezuela and Great Britain, by Chas. P. Daly, 566
Die Grenzen Venezuelas, von Prof. Sievers, 335, 446
Documents . . . relating to Boundary between British Guiana and, 445
Im Delta des Orinoko, von Graf. zu Erbach-Erbach, 566
Short Sketch of History, etc., 682
Venezuela, New Publications—*continued.*
The Facts about the Venezuela Boundary, by J Bolton, 334
Venezuela: her Government, etc., by W. E Curtis, 445
Venezuela and British Guiana Boundary, by Dr. H. R. Mill, 217
Zweite Reise in Venezuela, von Dr. Sievers, 446
Venezuelan and British Guiana Boundary Frontier, Mr. Dixon's note on, 99; *see also* British Guiana
Venezuelan claims in Guiana, 278
Vents et de la pluie, La circulation des, par M. Duponchel (New Publications), 118
Venukoff, M., Sur la réduction des cartes topographiques, etc. (New Publications), 447
Verde, Cape, currents round, 269
Verhelst, Ed., Aische-en-Refail (New Publications), 327
Verhoeff, C., Blumen . . . der Insel Norderney (New Publications), 439
Verrier, Dr., Étude des arbres à quinquina (New Publications), 219
Vesperas do Centenario, etc., by R. Dozy (New Publications), 439
Vibert, Paul, Exploration aux Antilles (New Publications), 335
Victoria glacier, New Zealand Alps, 495
———, Lake, Pamirs, 93
Victoria, New Publications—
Statistical Register of, 446
Victorian Year-Book, 1894..336
Victoria Nyanza, The New Road from Mombasa to the, 662
Vienna University, geography at, 91
——— Military Geographical Institute in, 91
Vilkitzki, Col., explorations of Siberian rivers, 545
Vilsalpsee, depth, etc., of, 199
Virginia Indians, Government, etc., of, by S. R. Hendren (New Publications), 334
Virginia, New Publications—
White Servitude in, by J. C. Ballagh, 216
Vistula, New Publications—
Die untere Weichsel und ihre neue Mündung, von Dr. Zweck, 327
Vogan, A. J., Map of the Coolgardie Goldfields (New Maps), 688
Volcanoes, New Publications—
Les phénomènes éruptifs sous marins, par J Girard, 568
Volcanic Phenomena, by J. L. Lobley, 568
Vomperkette des Karwendelgebirges, Studienfahrten im Gebiete der, von E. Platz (New Publications), 107
Voyageurs naturalistes, Conseils aux, par M. Filhol (New Publications), 340
Voyageuses françaises, Rôle des, par M. Barbier (New Publications), 224
Vuillier, M. G., La Sicile, impressions du present et du passé (New Publications), 328

Vuillot, M., book on the Sahara, notice of, 276
————, Carte topographique de la Région de Tombouctou (New Maps), 451

W.

Wadi el Ghan, Tripoli, 160
Wadi Thaika, Oman, 532
Wadi Tyin, Arabia, 522 *et seq.*
Wagner, Prof. H., Areal und mittlere Erhebung der Landflachen (New Publications), 218
————, Geographisches Jahrbuch (New Publications), 340
Wahab, Col., survey work on the Pamir Boundary Commission, 92
Wakamba tribe, E. Africa, 551
Wakilindi and other tribes, Lieut. Storch on the customs of, 429
Waldau, G., Resa till Ngolo-landet (New Publications), 563
Walker, General J. T., Obituary of, 320
Walker, J. B., Life and Voyages of, A. J. Tasman (New Publications), 684
Waller, Rev. H., Obituary of, 558
————, The Case of our Zanzibar Slaves (New Publications), 443
Walter, E., Does the Delaware Water Gap consist of Two River Gorges? (New Publications), 216
Warburg, Dr. O., The Discovery of the Moluccas, 365
————, Wer ist der Entdecker der Gewürz-Inseln? (New Publications), 563
Warri, Major Copland-Crawford's journey from, to Sapele, 661
Wästfält, H., Nagra skildringar fran den Wellmanska polarexpedition (New Publications), 567
Waswanipi lake, Canada, 316
Watendlath, Lakeland, 616
Waterways of English Lakeland, by J. E. Marr, 602 *et seq.*
Wauters, A. J., Bibliographie du Congo, 1880-95 (New Publications), 213; notice of, 276
————, Carte . . . du Chemin de Fer du Congo (New Maps), 342
————, Encore la question de la priorité de la découverte de l'Afrique centrale (New Publications), 113
————, La Rivière Sanga (New Publications), 442
————, map of the Sanga basin, note on, 552
————, on the Mahdist Power on the Upper Nile, 552
Waves, New Publications—
Lois de l'extinction d'une houle, etc., par M. Boussinesq, 118
Way, Mr., surveys of the Patkoi range, 202
Weatherley, Mr, new route to Lake Mweru, 204
Wegener, Dr. G., Herbsttage in Andalusien (New Publications), 440
Weiss and Schram, Publicationen für die Internationale Erdmessung (New Publications), 682
Weissbuch [Afrika], Sechszehnter Theil (New Publications), 442
Weissensee, depth, etc., of, 199
Wellby, Capt., A Trip in Somali Land (New Publications), 113
Welle and Darfur, Capt. Nilis' explorations between the, 203
Wellsted, Lieut., journey in Arabia, 522
Weltverkehrs, Wandkarte des, von A. Herrich (New Maps), 574
Werther, C. W., Oberflächengestalt und Klima von Usukuma (New Publications), 678
West, Dr., The Riviera, by Ch. Lenthéric, translated by (New Publications), 212
West, R. H., Barometrical Determination of Heights in Lebanon (New Publications), 678
West Indies, New Publications—
A West India Island, by Sir H. W. Norman, 335
Momenter af Vestindiens Geografi, ved C. H. Lassen, 217
Politisch-geographische . . . Westindien, von Dr. Deckert, 335
West Indies and Spanish Main, by J. Rodway, 566
Weston, Rev. W., Exploration in the Japanese Alps, 1891-94..125 *et seq.*
————, Explorations in the Japanese Alps (New Publications), 339
Westphal, Prof., Untersuchungen über den selbstregistrirenden Universalpegel zu Swinemünde (New Publications), 221
Weyer, Dr., Die magnetische Declination, etc. (New Publications), 449
Whales of the Antarctic, 516
Wheeler, Stephen, letter from, on the Anglo-Afghan Frontier Agreement, 674
White, A Silva, Australia as a Strategic Base (New Publications), 446
Wichmann, H., Der Streit über die Grenze von Britisch-Guayana (New Publications), 445
Widenmann, Dr., Bericht über die Klima Moshi am Kilimandjaro (New Publications), 332
Wiegand, Dr., Deutsche Kolonisation in Südamerika (New Publications), 217
Wif, Wadi, Tripoli, 159, 160
Wilcox, W. D., Lake Louise in the Canadian Rocky Mountains, 49 *et seq.*
Williams, H. S., James Dwight Dana (New Publications), 222
Williams, J. C., The Future of our Sugar-producing Colonies (New Publications), 341
Willis, B, Development of the Geologic Atlas of the United States (New Publications), 444
Willkomm, Prof. Dr. M. (New Publications), 339

W[illegible]
Wilson, H. W., The Protection of our Commerce in War (New Publications), 340
Wilson, Sir C. W., Remarks on "Proposed Geographical Description of the British Islands," 356
————, Review of Professor Ramsey's work on Phrygia, 190
Winchell, H. V., and Grant, U. S., Report on the Rainy Lake gold region (New Publications), 334
Windermere, stream diversion at, 619
Winds, New Publications—
Variations de la vitesse des vents, etc., par J. Plumandon, 220
Winnipeg, Lake, Mr. Tyrrell's work east of, 413
Wise, W. L., Gleanings from Patent Laws of all Countries (New Publications), 685
Witwatersrand, New Maps—
Map of the, by S. Goldman, 121
Woeikof, A., Das Centralasiens (New Publications), 677
————, Geologische Klimate (New Publications), 117
Wolkenhauer, W., Otto Ehlers (New Publications), 569
————, Joseph Thomson (New Publications), 339
Women, Part of, in Colonization, C. Lemire on (New Publications), 118
Wom river, French Congo region, 553
Woodthorpe, Col., Remarks on "A Journey across Tibet," 489
————, The Country of the Shans, 577 *et seq.*
————, The Shan Hills (New Publications), 441
Woodward, Dr., Remarks on "The Waterways of English Lakeland," 622
Woodward, H. P., Mining Handbook to Western Australia (New Publications), 336
World, New Maps—
Spamer's Grosser Hand-atlas, 574
Travellers' Route Chart of the, by J. G. Bartholomew, 452
Wandkarte des Weltverkehrs, von A. Herrich, 574
Worsfold, W. B., South Africa (New Publications), 215
Wortzusammensetzung im Griechischen, etc., von Dr. Muller (New Publications), 685
Wouwermans, A., Contribution à la bibliographie de la locomotion aerienne (New Publications), 223
Württembergische Forschungsreisende and Geographen, von E. Metzger (New Publications), 569
Wyoming, New Publications—
Geological Reconnaissance in, by G. H. Eldridge, 216

Y.

Yakeyama peak, Japanese Alps, 147
Yakút al Rumí, account of Kais, 647
Yang Lam chief, burial rites of a, 598
Yangtse Kiang, New Publications—
2500 kilometer opover Yangtse Kiang af W. Coucheron-Aamot, 111
Zwei Jahre am, von Prof. Hirth, 329
Que signifie le nom de Yangtze? par L. Metchnikoff, 562
Yangu village, position of, 429
Yaos in British Central Africa, 378
Yarigatake, Japanese Alps, 128, 147
Yates, O. V., The Northern Balochis (New Publications), 110
Yellowstone National Park, by H. M. Chittenden (New Publications), 680
Yenisei, Explorations of the, 545
Yezd, Persia, 28, 29
Younghusband, Capt. F. E., Narrative of Travels in Manchuria . . . Pamirs and Chitral (New Publications), 562
Younghusband, Capts. G. J. and F. E., The Relief of Chitral (New Publications), 212
Yucatan, New Publications—
Flora of, by C. F. Millspaugh, 444
Yukatekische Forschungen, von T. Maler, 115
Yukatekische Forschungen, von T. Maler (New Publications), 115
Yun-nan to British India, by Prince Henry of Orleans, 300
Yunnan, New Publications—
Lettre sur le, par M. Roux, 329

Z.

Zanzibar Slaves, The Case of our, by Rev. H. Waller (New Publications), 443
Zatri, Jebel al, 532
Zenda-Rud river, Persia, 168
Zhdanko, Lieut., on hydrographic researches in the Arctic Ocean, 555
Zoroastrian cities, ruins of, in Persia, 34, 35, 39
Zululand, New Maps—
Map of, showing positions of Gold and Coal Fields, etc., by J. Garrard, 121
Zurich, Lake of, origin of, 655
Zweck, Dr., Die untere Weichsel und ihre neue Mündung (New Publications), 327

INDEX TO MAPS.

EUROPE.

English Lake District—
Map of, showing Relation of Radial Drainage to Geological Structure, 603
Færoe Islands, Sketch-map, 3
Map to illustrate a paper on the Waterways of English Lakeland, 688
North Sea and Atlantic Ocean, Surface temperature of, Plates 6–10..344
North Sea, Barometer Charts of the, 258–261
————, Surface salinity of, Plates 1–5..344

ASIA.

El Kais, Persian Gulf, Sketch-map, 647
Japanese Alps, Sketch-map of, 228
Makran, Sketch-map of, 452
Persia, Central, Map of Capt. Vaughan's routes in, 124
Siam and Indo-China, Sketch-map of, 298
Sketch-Map of the Shan States, 688
Tali-fu and Sadiya, Sketch-map of territory between, 302
Tarhuna and Gharian, Tripoli, 228
Tibet, Mr. Littledale's routes in, Maps of, 576
Wadi Tyin, Arabia, Sketch-map of, 576

AFRICA.

Chikala to Lujende, Sketch-map of route from, 185
Ethiopian Region of the Geography of Mammals, 344
Niger Region, Upper, Sketch-map of, 98
Ulu and Kitwyi, Sketch-map of, 452

AMERICA.

British Guiana, Sketch-map of, 100
Canada, Louise, Lake, Sketch-maps of Region of, 51, 53
Kuyuni, Upper, British Guiana, Sketch-map of, 576

ANTARCTIC.

Graham Land, Antarctic, Sketch-map of, 509

AUSTRALASIA

New Zealand, Southern Alps of, Sketch-map of, 576
Niuafóu, South Pacific, Plan of, 67

ILLUSTRATIONS AND DIAGRAMS.

EUROPE.

English Lakeland—
Edenside, view of, 606
Haweswater from Measand, 614
High Cup Valley, Diagram section through, 607
High Cup Gill, Head of, 608
Nunnery Walks, 609
Stonethwaite, alluvial flat, 618
Sty Head Tarn, 617
Windermere, Diagram Section from, 612

Færoes—
Drangar and Tindholm, 15
Glacial striæ at Trangisvaag, 17
Klaksvig, Bay of, 7
Leinum, View from, 5
Myggenæs—Landing-place, 11
Saxen, Cliff south of, 13
Tindholm from south, 9

ASIA.

Japan—
Hashido, Bridge over Ontakegawa, 141
Hodakayama from the east, 127
Kasadake, Ravine south of, 131
Mountain pilgrim, 145
Ono No Taki waterfall, 135
Ontake crater, 133
Ontake, Shrine on summit of, 143
Tenryugawa, Silk filatures on the, 140
Yarigatake, Ridge south of, 129
Kais, Persian Gulf, ancient subterranean aqueduct, 645
Shan Country—
Ban Law Ferry, 583
Inle Lake, 585
Shan Country—
Kaw Village, 592
Keng Kong, 595
Mekong above Tang Aw, 579
Monastery, Pung Pyin, 597
Wan Tham, 581
Western Shans, 589
Tibet—
Boat laden with baggage on the Sachu Chu, 457
Goring La, View near the, 459
Lamas' encampment, 465
Tibetan valley, Typical, 461
——— group, 463

AFRICA.

British Central Africa—
Cheza peak in the Mlanji hills, 379
Chiromo, on the Ruo, 371
Fort Lister, Stream at, 383
Mlanje post-office, 384
Nyasa, Lake, south end of, 375
Ruo, Falls of the, 381
Shire rapids, Upper, 373
Yao village, Blantyre, 377
Zambezi near Chapinga, 369
Zomba, Native woman of, 382
Tripoli—
Isolated hills near Wadi Haira, 161
Jebel Jumma, 159
Kasr Zuguseh, 155
Roman wall in Wadi Daun, 157
Senam at Kom es Las, 153
——— bu Matirah, 157
——— el Megagerah, 159
Shaahbet el Zeraghwanieh, 161
Wadi Doga, 151

AMERICA.

Canada—
Lake Louise, end of west shore, 55
Lefroy, Mount, Looking towards, 57
Canada—
Paradise valley, Entrance to, 59
Temple, Mount, 61, 63

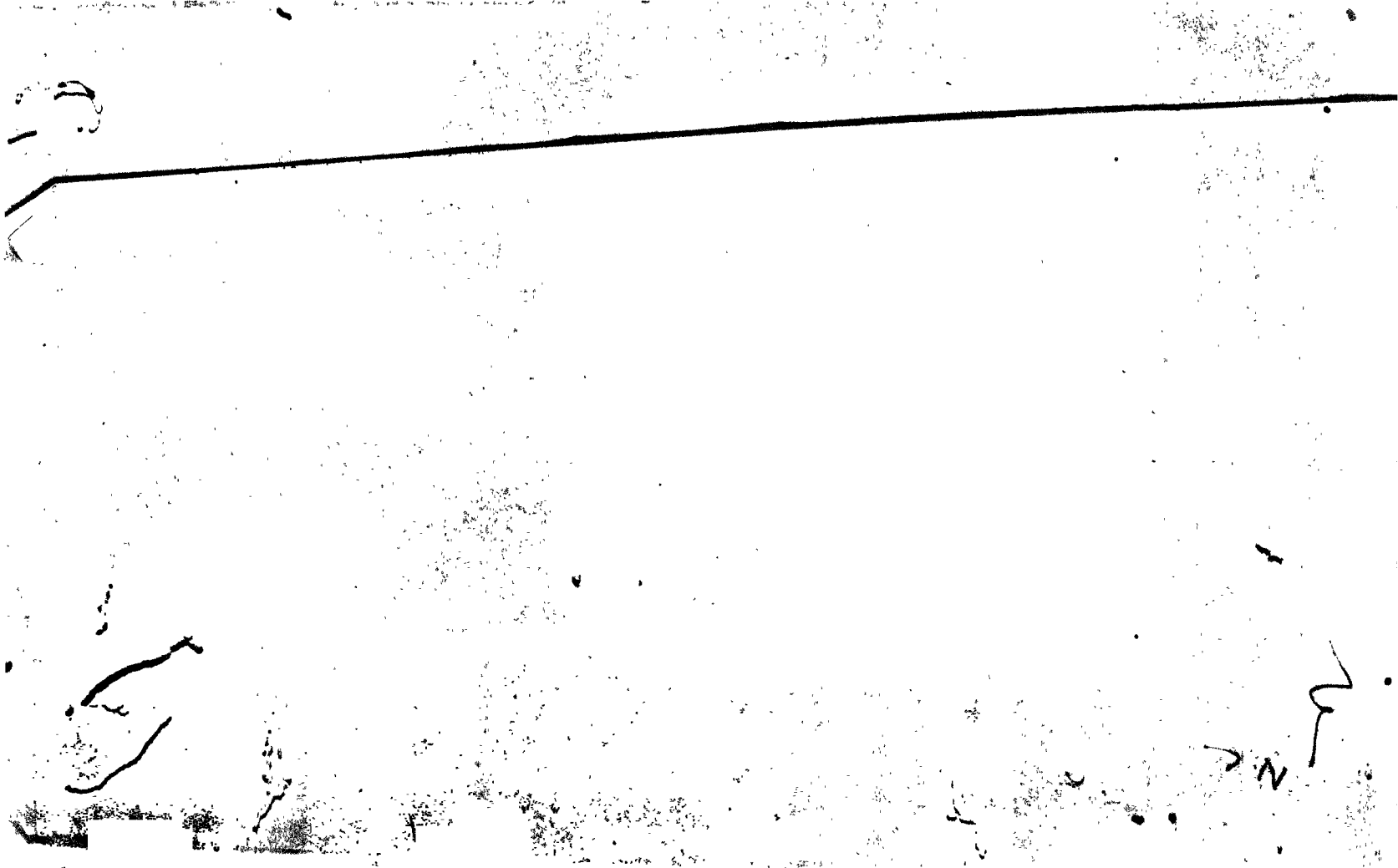
AUSTRALASIA.

New Zealand—
Copland river, Looking down the, 489
Franz Josef glacier, 495
Graham's Saddle, 497
Marchant valley, Looking down towards the, 487
Tasman, Mount, 493
Tasman valley, 485
Victoria glacier, Cliff precipices coming down to the, 491
Niuafóu, South Pacific, View of craters, 67, 68

GENERAL.

Challenger Medal, 207
Diagrams for predicting the Circumstances of an Occultation of a Star by the Moon, 688
Earth's Crust, Diagrams illustrating movements of the, 251–255

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